DOCUMENT RESUME

ED 208 134 CE 030 057

TITLE Vocational and Technical Education: Development of Curricula and Instructional Materials with Focus on Mechanical and Civil/Building Subjects. Asian Programme of Educational Innovation for Development. Report of a Technical Working Group Meeting (Seoul, Korea, October 15-27, 1979).

INSTITUTION United Nations Educational, Scientific, and Cultural Organization, Bangkok (Thailand). Regional Office for Education in Asia and Oceania.

PUB DATE 80

NOTE 123p.

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.

DESCRIPTORS *Building Trades; *Curriculum Development; *Developing Nations; Educational Innovation; Educational Research; *Material Development; Mechanical Skills; *Mechanics (Process); Meetings; Observation; Postsecondary Education; Regional Cooperation; Secondary Education; Technical Education; Trade and Industrial Education; *Vocational Education

IDENTIFIERS Asian Programme of Educ Innovation for Development; Participant Observation

ABSTRACT

This report contains materials from a meeting of Asian Programme of Educational Innovation for Development member states to identify common trends, issues, and growth points related to the development and implementation of technical and vocational education curricula. Chapter 1 presents extracts from country reports of experiences in curriculum planning and instructional materials development for the mechanical and civil building trades. Countries include Bangladesh, India, Indonesia, Japan, Republic of Korea, Malaysia, Pakistan, Philippines, and Sri Lanka. Chapter 2 summarizes experiences of countries represented at the meeting. Syntheses are based not only on the country papers, but also on participant observations and findings made during field visits to institutions and projects. Information is presented on strategies and methodologies for curriculum planning and instructional materials development, innovative features, problems and constraints encountered and strategies and methodology to solve problems, and future plans. Chapter 3 presents suggestions for development of curriculum instructional materials for mechanical and civil/building subjects in vocational and technical education. Conclusions and recommendations for future regional cooperations are described in chapter 4. Annexes include inaugural and welcome addresses, list of documents and reference materials, sample forms for instructional planning, and format for and reports from field visits. (YLB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

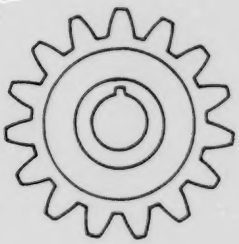
ED208134

Asian Programme of Educational Innovation for Development APEID

VOCATIONAL AND TECHNICAL EDUCATION: DEVELOPMENT OF CURRICULA AND INSTRUCTIONAL MATERIALS WITH FOCUS ON MECHANICAL AND CIVIL/BUILDING SUBJECTS

Report of a Technical Working Group Meeting
(Seoul, Republic of Korea, 15-27 October 1979)

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.



"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY
UNESCO Regional Office for Education in Asia and the Pacific
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Contents

Introduction 1

Chapter I : Extracts from the country reports of experiences in curriculum planning and instructional materials development for the mechanical and civil/building trades in vocational and technical education 4

Chapter II : Synthesis of country experiences 43

Chapter III : Suggestions for development of curriculum and instructional materials for mechanical and civil/building subjects in vocational and technical education 61

Chapter IV : Conclusions and recommendations for future regional co-operative actions 79

Annexes 83

UNESCO REGIONAL OFFICE FOR EDUCATION IN ASIA AND OCEANIA
Bangkok, 1980

CE030057

The APEID Technical Working Group Meeting on Curriculum Development and Instructional Materials Design in Vocational and Technical Education with focus on Mechanical and Civil/ Building Subjects was jointly organized by the Korean Educational Development Institute, Seoul, and Asian Centre of Educational Innovation for Development, Unesco Regional Office for Education in Asia and Oceania, Bangkok.

APEID Technical Working Group Meeting on Vocational and Technical Education, Seoul, 15-27 October 1979.
Vocational and technical education: development of curricula and instructional materials with focus on mechanical and civil/building subjects; report. Bangkok, Unesco, 1980.
112 p. (Asian Programme of Educational Innovation for Development)

1. TECHNICAL EDUCATION - CURRICULUM DEVELOPMENT - ASIA. 2. VOCATIONAL EDUCATION - ASIA. 3. TECHNICAL EDUCATION - INSTRUCTIONAL MATERIALS - ASIA. I. Unesco. Regional Office for Education in Asia and Oceania, Bangkok, II. Title. III. Series.

607
371.32
375.1

Opinions expressed in this publication are those of the participants of the Technical Working Group Meeting, and do not necessarily coincide with any official views of Unesco. The designations employed and the presentation of the material herein do not imply the expression of any opinion whatsoever on the part of Unesco concerning the legal status of any country, or of its authorities, or concerning the delimitations of the frontiers of any country or territory.

TABLE OF CONTENTS

Introduction 1

CHAPTER I : Extracts from the country reports of experiences in curriculum planning and instructional materials development for the mechanical and civil/building trades in vocational and technical education . . 4

Bangladesh 4

India 8

Indonesia 15

Japan 18

Republic of Korea 23

Malaysia 28

Pakistan 30

Philippines 33

Sri Lanka 38

CHAPTER II : Synthesis of country experiences . . 43

CHAPTER III : Suggestions for development of curriculum and instructional materials for mechanical and civil/building subjects in vocational and technical education 61

I. Suggestions for development of curriculum in vocational and technical education . 61

II. Suggestions for development of instructional materials in vocational and technical education 70

CHAPTER IV : Conclusions and recommendations for future regional co-operative actions . . . 79

Conclusions 79

General recommendations for collaboration among participating countries 80

ANNEXES :

Annex I : List of participants and observers and secretariat of the meeting . . . 83

Annex II : Officers of the meeting 86

Annex III : Working groups for analysing and synthesizing the Asian experiences 87

Annex IV : A. Inaugural address 88

B. Welcome address 91

Annex V : List of documents and reference materials . 93

Annex VI : Sample forms for instructional planning . 96

Annex VII : List of institutions visited in the host country 100

Annex VIII : Format for compiling information during the visits 101

Annex IX : Visits to some innovative projects . . 102

INTRODUCTION

1. Background

While formulating the guidelines for APEID's second cycle plan, the Fourth Regional Consultation Meeting on APEID, Bangkok, 1977 suggested the addition of a new area of innovation, namely Vocational and Technical Education. Vocational and technical education is related closely to other areas of innovation in APEID, notably curriculum development, science education and non-formal education.

Considering that vocational and technical education is a new area of innovation under APEID, the main thrust at this stage is on collection and regular exchange of innovative experiences; collaborative designing of strategies, methodologies, and instructional materials in the various fields of vocational and technical education including training of teachers; and co-operative research and development on problems of common concern to the Member States. These thrusts will be linked to two development themes, namely: development of productive skills and integrated rural development.

One of the projects in the Work Plans of APEID related to vocational and technical education has special emphasis on innovative curriculum planning and relevant educational materials design.

In the execution of this project, a series of Technical Working Group Meetings for curriculum planning and instructional materials design are envisaged to take place.

2. Objectives of the Meeting

The present meeting, the first in the series, was convened with the following objectives:

i) to analyse the existing methodologies and approaches in curriculum planning and in developing instructional materials for mechanical civil/building subjects of the area of vocational and technical education;

ii) based on synthesis of experiences of on-going innovative projects in the countries, to develop suggestions for the organization, programme content, instructional materials, physical facilities and preparation and up-grading of technical teaching staff.

3. Participation

Sixteen participants from nine Unesco Member States attended the Meeting; one each from Bangladesh, Indonesia, Pakistan, and Sri Lanka; two each from India, Japan, Malaysia and the Philippines; and four from the Republic of Korea and - in addition - six observers.

4. Inauguration of the Meeting

The Meeting was inaugurated by Dr. Yung Dug Lee, President of the Korean Educational Development Institute. The participants were welcomed by Mr. Kim Kyu-Taik, Secretary-General of the Korean National Commission for Unesco on behalf of the Government of the Republic of

Korea and by Dr. M.C. Pant and Mr. A. Dyankov, on behalf of the Unesco Regional Office for Education in Asia and Oceania.

In his inaugural address Dr. Yung Dug Lee underlined the fact that if the educational system is to be viable in the contemporary world it must have an ability to keep itself fully relevant to our present needs. Further, he stressed that it may take great efforts to search for more relevant curriculum and for more effective ways of teaching, concluding that the establishment of a research centre exclusively related to technical education may be a vital investment to this end.

In order to solve the existing problems that face the development of technical and vocational education, Dr. Lee suggested the following main directions of future activities:

a) Classification of the goals of vocational and technical education;

b) re-orientation of the existing forms and practices of vocational/technical education towards producing well over-all educated persons rather than ones narrowly geared towards training for a specific occupation;

c) introducing such elements in education that would secure greater adaptability to rapidly changing situations and technological progress;

d) instead of imitating foreign technology, to develop creativity in each person so as to contribute to the country's social and economic development;

e) to develop technical education so as to cultivate a healthy attitude towards productive work and to establish the kind of co-operation needed for the country's national development;

f) an intensive scheme for technical teachers' preparation to be conceived, while searching for various alternatives to teacher preparation and up-grading.

Mr. Kim Kyu Taik extended a warm welcome to the participants on behalf of the Korean National Commission for Unesco, emphasizing the need of future inter-country co-operation in order to ensure that regional development takes place equally throughout all Asia. In his words, "behind us we leave colonialism, famine, war and poverty. Ahead of us lie development and propserity. Unlike our forefathers, we are privileged to view the resurgence of an entire continent comprising more than half of the population of the world".

Welcoming the participants, Dr. M.C. Pant briefly presented the Asian Programme of Educational Innovation for Development (APEID) and thanked the Government of the Republic of Korea, the host institution, and the Korean National Commission for Unesco for their co-operation and assistance.

5. Officers of the Meeting

The Meeting elected a chairman, two vice chairmen and three rapporteurs:

Chairman

Dr. Yung Dug Lee (Republic of Korea)

Vice-chairmen

Prof. N. Selvarajan (India)
Prof. Akira Konno (Japan)

Rapporteurs:

Prof. Diosdao C. Nicdao Jr. (Philippines)
Mr. Abdul Aziz bin Husbullah (Malaysia)
Mr. S. Kapuduwa (Sri Lanka)

6. Method of work adopted and proceedings of the Meeting

The Technical Working Group Meeting comprised

a) Plenary sessions

b) group work in

i) three working groups for analyzing and synthesizing Asian countries' experiences and one group for synthesizing the observations during the visits to some Korean institutions;

ii) two working groups for developing suggestions for mechanical and for civil/building subjects curricula and instructional materials;

iii) editorial team for finalizing the draft country reports, synthesis of experiences and suggestions.

c) visits to institutions of vocational and technical education.

For organizing the on-site study visits and compilation of information during the visits a special format was developed, which is shown as Annex VII.

The list of the institutions visited is enclosed as Annex VIII.

The reports on the field visits are provided in Annex IX.

DOC 8

CHAPTER I

EXTRACTS FROM THE COUNTRY REPORTS OF EXPERIENCES IN CURRICULUM PLANNING AND INSTRUCTIONAL MATERIALS DEVELOPMENT FOR THE MECHANICAL AND CIVIL/BUILDING TRADES IN VOCATIONAL AND TECHNICAL EDUCATION

BANGLADESH

1. Introduction

General education in Bangladesh consists of five years of primary education, five years of secondary education, two years of higher secondary education and four years of higher education in universities.

Vocational education begins after eight years of schooling. 'Technician education' begins after 10 years of general education and 'Engineering education' after 12 years of schooling.

2. Organization and structure of vocational and technician education

The objective of vocational education is to produce 'craftsmen and skilled workers' who are directly involved in actual production, machine operation and maintenance. Those skilled workers are prepared through two years vocational courses offered after eight years of schooling.

The objective of the technician education is producing technicians who occupy positions between engineers and craftsmen. The duration of the technician courses is three years after 10 years of general education. The entry requirement for this level of education is based on a minimum of 40 per cent in mathematics and a total of 45 per cent marks in the secondary school examinations.

3. Final products and employment opportunities

i) Vocational education

An engineering 'trade certificate' is offered after successful completion of the course. Employment opportunities are not encouraging at present. Graduates are likely to be employed as carpenters, cabinet-makers, plumbers, pipe fitters or masons in governmental or private organizations. This course is also designed to prepare for self-employment.

ii) Technician education

A "Diploma-in-engineering" certificate is offered after successful completion of the courses. Employment opportunities are encouraging, especially for technicians in 'civil trades'. They are employed as supervisors, surveyors, etc., in the construction field. This course also provides preparation for self-employment.

4. Curriculum planning

Curricula in both vocational and technician education have been designed with the above objectives in view. The Board of technical education, an autonomous body under the Ministry of Education, is responsible for the developing and designing of the curricula.

5. Principles, strategies and methodologies in curriculum planning

The curricula are developed and designed on the basis of certain principles, through the following phases:

i) Planning phase:

Objectives are identified through the following tasks and activities:-

- Study of technicians' jobs
- Job analysis to identify the necessary knowledge, skills and attitudes
- Entry behavior of the students
- Identification of courses

ii) Development phase:

Curriculum is developed through the following tasks and activities:-

- Specification of course content
- Production of resource materials
- Training of teachers

iii) Evaluation phase:

The curriculum is evaluated through the following tasks and activities:

- Assessment of students' performance
- Assessment of teaching-learning resources
- Study implementation
- Assessment of graduates' performance

6. Problems and constraints encountered:

i) Proper evaluation of the curriculum has not been done for a long time. The curriculum has not been revised since 1968 so as to fulfil the requirements of modern skills and techniques as required in industries.

ii) Lack of adequate resources (books, raw materials, tools and equipment, stationery, etc.) due to shortage of funds.

iii) Shortage of adequate number of teachers and in particular shortage of trained teachers. Teachers are overloaded with teaching load by almost 1½ times the optimum load of 18 hour/week.

iv) The examinations are predominently theory-oriented, the practical work has been neglected to a certain extent.

v) The attitude of the society being in favour of "certificate holder" makes a student examination-oriented, bookish and certificate-seeker to the neglect of the requirements for skill development, learning and understanding as outlined in the objectives of the course.

7. Curriculum for technician education for civil and building subjects

The technician education for civil and building trades is offered at post-secondary level through the Polytechnic Institute of the country and the duration of the courses is three years for each trade.

The courses related to civil/building trades offered in this catagory are: (i) course in architecture, (ii) civil technician course, (iii) surveying course, and (iv) course in building technology.

8. Subjects offered:

a) At the vocational-level courses for building trades, some of the main subjects are: masonry, plumbing, and woodworking;

b) The technician level courses in building technology include the following groups of subjects:

i) General subjects: mathematics, physics, chemistry, English, occupational guidance, report writing, applied mechanics.

ii) Workshop practice: woodworking, welding, foundry, metal working, electrical wiring.

iii) Special subjects: electricity, building materials, strength of materials, drawing, estimating, soil mechanics, surveying, plumbing, hydraulics, water supply, railways and highways, structures, irrigation and flood control, construction, and sanitary engineering.

9. Relation between theory and practice in various courses:

In vocational education: 20 per cent theory and 80 per cent practical training.

In technician education: 40 per cent theory and 60 per cent practical training.

The students at vocational-level courses are required to perform various production jobs in the training workshops.

At technician levels: the jobs are not so much production-oriented. The aim of workshop practice at this level is to develop in the students the basic skills required for technician jobs.

10. Rural and urban programmes

All vocational and polytechnic institutes of the country are situated in urban areas. The variety of trades offered at vocational level are identified according to the regional demands, so as to meet

the local needs. More emphases are needed towards implementing integrated rural development.

11. Methods of evaluating students' progress

Students' performances are evaluated through:

i) Examinations;
ii) observation of teaching-learning activities while schooling;
iii) observation of graduates' activities after schooling;
iv) discussion with the teachers/students/employers.

12. Development of instructional materials

Mostly textbooks and reference books are used as instructional materials. 'Handouts' are used when the number of students in a classroom is fairly large and there is some shortage of textbooks.

A great disadvantage is the lack of textbooks in the mother tongue. Ninety per cent of the textbooks are imported and are of very old editions, their number is inadequate for the number of students. One single book is issued to a number of students on rental basis for a semester. Because of the shortage of foreign exchange, the rate of acquisition of new books is very slow, close to zero.

When subjects cannot be taught by illustrations in two dimensions only, a three-dimensional model is used. A 'real object' is used when all essential parts and movements are required to be demonstrated and the object is not too large or too small for classroom demonstration. Charts and models are used when real objects are not available.

Job sheets/laboratory sheets are not available for all jobs because insufficient attempts have been made to prepare them. The lack of these materials is also due to the shortage of trained teachers.

Almost all institutions are equipped with audio-visual aids but they are not adequately used, again due to a shortage of properly-trained teachers. Most of the instructional A.V.A. materials, except the hardware, are produced by the respective instructors. Hardware is centrally supplied to the institutions by the Directorate of technical education.

13. Problems in the development of curriculum and instructional materials

i) Job descriptions for various profiles of technicians or craftsmen are not always available.

ii) It is difficult to make proper time allocation for different subjects.

iii) The entry behaviour of the students is not oriented to technical education.

iv) Shortage of trained teachers.

v) Shortage of specialists able to prepare instructional materials.

vi) Lack of proper and timely co-ordination between industries and schools.

14. Innovations:

a) In curriculum development:

i) A more systematic approach is being recently followed;

ii) A study of technicians' jobs to identify the knowledge and skills required of students has been arranged through on-the-job training for teachers and students.

iii) To understand modern trends in industries and to acquaint industrialists with the curriculum for purposes of evaluation and guidance, mutual visits between schools and factories have been introduced.

b) In instructional materials development:

i) Special materials for in-service industrial training

ii) Use of industrial scraps as practical training materials in institutions;

iii) Encouraging consultation with the industries for the production of instructional materials;

iv) Field visits.

15. Future plans

It is planned to make provisions for higher education for the students of technician courses. The government has decided to set up a separate 'college of engineering' to offer a special three-year course leading to a bachelor's degree in engineering for the Diploma-in-Engineering certificate holders. This provision will help to attract students of better calibre and will result in better output from the polytechnics.

INDIA

1. Introduction

a) Educational system in the country:

i) General education: five years of primary education followed by five years of secondary education. Higher secondary education for two years with emphasis on academic stream or vocational stream.

In India, at the secondary level, there are at present about 33,000 high schools (10 years' schooling). At the higher secondary level, it is estimated that there are about 9,700 institutions in the country providing facilities for higher secondary (10 + 2 years) general education, of which 4,100 are catering to the 'rural needs' and the remaining 5,600 for the 'urban needs'.

ii) Tertiary education (university education): Three-year bachelor degree course, followed by master degree or two-year post-graduate courses are offered in colleges or universities.

b) Vocational training programmes: The National Council for Training in Vocational Trades is the central agency for co-ordinating the training programmes in the country, bringing certain uniformity in the standards and awarding certificates of proficiency in craftsmanship. The industrial training institutes impart craftsman training schemes in different vocational trades whose curricula are developed and controlled by the Directorate of Employment and Training, Ministry of Labour, Government of India. The central training institutes and advanced training institutes provide advanced training for the instructors and other technical personnel and are assisted by International Labour Organisation.

c) Craftsmen training schemes

The craftsman-training schemes have been planned with the following objectives:

i) to ensure a steady flow of skilled workers in different trades for industry;

ii) to raise the quality of industrial production by systematic training of workers;

iii) to reduce unemployment among the educated youth by preparing them for suitable industrial employment.

For example, the following are a few crafts from the mechanical engineering field, in which craftsman-training schemes are presently offered:

(1) Blacksmith
(2) Carpenter
(3) Fitter
(4) Grinder
(5) Machinist
(6) Mechanic - Instruments
(7) Mechanic - Refrigerators
(8) Moulder
(9) Pattern Maker
(10) Sheet Metal Worker
(11) Tool Maker
(12) Mechanic - I.C. Engines
(13) Turner
(14) Welder (gas and electric)
(15) Plumber
(16) Mechanic - Tractors
(17) Die Fitter
(18) Draughtsman - Mechanical
(19) Electroplater, etc.

d) Three-year diploma courses are offered by the polytechnics. The entry requirement is a "pass" in 10th grade. In selected areas, one-year post-diploma courses are offered. For the industrially-oriented profiles, three and a half years' sandwich courses are offered. Four-year degree courses in engineering are offered by the engineering colleges, followed by two-year masters degree programmes in engineering.

For example, the three-year polytechnic course in civil/ building trades offers the following courses to the students:

During the first year, they study English, mathematics, applied science (physics and chemistry), technical mechanics, surveying, materials of construction, drawing and practical survey. In the second year, they study construction practice, strength of materials and theory of structures, hydraulics, transportation engineering, surveying, practical survey, civil engineering drawing, hydraulics laboratory and strength of materials laboratory. In the third year, they receive knowledge in some applied subjects like structural engineering, irrigation, public health engineering, construction management and building technology. They also do a project. For the employed candidates in the private and public sectors who have graduated from the industrial training institutes, evening part-time courses of eight semesters' duration are conducted in polytechnics situated in large towns and cities.

e) Non-formal education: workers' education programmes, correspondence courses and continuing education programmes are offered by various educational institutions.

One particular form of non-formal education is provided through the apprenticeship training scheme.

The apprenticeship training programme has been implemented to a large extent for providing the industries with the much-needed skilled manpower. Statutory provision was made by enacting the "central apprentices act" to regulate and enforce a uniform system of training throughout the country. This act has made it obligatory on the part of industries to provide placement and training for specified number of apprentices at different levels.

The apprenticeship training is given to the craftsmen after their completion of the training programmes at industrial training institutes, in selected industries. The co-ordination and maintenance of standards of training, being prescribed by the Central Government, are carried out by the Central Apprenticeship Council which is comprised of representatives of employees, employers and administrators.

f) Objectives of the vocational/technical training and job opportunities

Course	Entry Requirements	Objectives	Employment Opportunities
I.T.I. Certificate	Passing 10th grade	To ensure a steady flow of skilled workers in various trades for the industry	Skilled workers in industries
Certificate courses of Advanced training institutes	Service personnel	To update and upgrade skills	Craftsmen, candidates already in employment
Diploma (3 or 3½ yr. polytechnics)	Passing 10th grade	To provide a sound, broadly-based knowledge in theory of a selected field of engineering; to train technicians to calculate, draw, design, fabricate, produce	Middle level position in industries and technical services, like foreman, supervisor, head draughtsman, estimator
Degree (5 yr/4 yr)	Passing secondary education	To train the engineers who will design, draw, estimate, and plan production	Junior executives and assistant engineer level (class I officers of Govt.)
3½ yr.	Diploma and 2 yr. of experience	To retrain technicians and to provide opportunities for professional growth	To further qualify in order to occupy higher positions
Technical teacher training courses	Diploma or degree or M.S.C.	To train the teachers of polytechnics	Teachers in polytechnics

2. The basic principles, strategies and methodologies adopted in curriculum planning for technical and vocational education are based on job analysis, task analysis, interview, questionnaire, research techniques. The theoretical part of the training of technicians and engineers occupies 60 per cent of the time and the practical training takes 40 per cent. Students are sent to various industries for on-the-job training. The "earn while you learn" scheme has given good opportunities for skill development. A number of courses are offered as electives. Based on some review of the curricula made by the industries/employers, the curricula are being revised and updated.

The present-day curricula in civil/building engineering, for example, are structured to suit the present needs of the industries. Analysing the job specifications of technicians, the content of the knowledge of various subjects and the extent of skills and abilities

required of them were determined and the revised curricula formed. The curricula prepared by Technical Teachers Training Institute, Madras, for example, cater to the concrete needs of the five states situated in the southern region.

For example, in the civil engineering field the following departments, being the major sectors of intake, are involved in this process:

- Transportation : Highways (National and Rural)
- Irrigation : Major projects, medium projects, minor projects
- Public Health : Water and Drainage Board
- Engineering : Municipal Corporations
- Building : Electricity Board
  Structural Engineering Firms
  Housing Boards
  Architectural Firms etc.

As a result, a revised curriculum oriented towards the practical needs of employment has been set.

In the revised curriculum the following workshop practices have been included:

(1) Carpentry;
(2) Woodwork and metalwork contruction practice;
(3) House wiring;
(4) Concrete construction practice;
(5) Welding;
(6) Plumbing.

3. Strategies, methodologies and institutional arrangements used in development of various instructional materials

Quality improvement programmes and curriculum development courses are conducted for the development of curricula and instructional materials. The state governments have their own curriculum development centres to produce suitable textbooks. Some of the curriculum materials are field-tested. Selected institutions are given direct assistance by the central government to start functioning as instructional resource centres.

The student support materials, item/question banks, laboratory manuals, and drawing manuals are prepared by conducting special workshops at some extension centres and at various polytechnics. Mainly some experienced teachers and the teachers who handle that subjects are involved in those workshops, which are organized under the so-called Quality Improvement Programme. The material is being edited and published by the Curriculum Development Centres. Two copies of each publication are sent to each polytechnic.

4. Main innovative features in the country's experiences in curriculum planning and instructional materials design

a) Community polytechnics to serve the regions.

Certain polytechnics in every state have been selected as Community Polytechnics and the Government of India has granted

considerable aid for the development of these institutions. Making use of local available resources, elective subjects are contemplated in the existing branches.

b) Sandwich courses with industrial orientation.

The main achievement of each sandwich course is that it provides some very essential training in the industry for a diploma holder to fit himself to the needs of the prospective industrial employer. The trainees gain actual workshop practical experience during a period of 12 months spread over a time span of 2½ years.

The sandwich courses have brought a revolution in the structure and organization of the technical education that is essential for the modernization and updating the curriculum of the polytechnics.

c) Developing special curriculum for one-year post-diploma courses in industrially-oriented areas of specialization. Technicians who are already diploma-holders and who have been in service for one year or more, are eligible for studying the advanced diploma course of about one year duration. These courses are again offered for selected specialities in a few polytechnics to meet the needs of particular industries.

d) Building of validated item banks for classroom use.

The item/question bank contains a pool of items which are suitable for administering to a particular population of students and about which satisfactory information of technical nature like facility value and discrimination index is available. The bank is composed of objective type items, restricted response or structured essay questions and open-ended questions.

List of item banks available at the Technical Teachers Training Institute (Southern Region), Madras:

(1) Survey;
(2) Applied Mechanics;
(3) Strength of Materials;
(4) Structural Engineering;
(5) Public Health Engineering;
(6) Hydraulics and Hydraulic Machinery;
(7) Construction Management.

e) Establishment of instructional resource centres.

Variety of instructional materials are being designed, built, popularized and distributed by those centres. Recently they have produced, for example, various multimedia learning packages. For each subject appropriate aids are selected and prepared. Manuals are prepared to give details regarding the objectives, demonstration techniques and construction of some of the selected static and dynamic models. The learning packages were developed by experienced teachers of polytechnics with the guidance of staff members of the civil engineering faculty of the T.T.T.I.

f) Promoting local educational film production.

g) Compiling curriculum for 3½-year degree courses for the diploma-holders.

h) Development of instructional materials for modern methods and techniques such as team teaching, laboratory-centred instruction and the project method. The following types of instructional materials have been developed:

i) Student support materials: To promote effective learning in various subjects, various teaching techniques have been adopted.

ii) Programmed instructional materials: As the capacity and time to learn varies from individual to individual, programmed instruction offers a solution for polytechnic teachers, who may administer them in various classroom situations.

The programmes in this series have been prepared by a group of practising polytechnic teachers drawn from different parts of India under the guidance and supervision of the staff of the Technical Teachers Training Institute, Madras, and subjected to field trials in several polytechnics in India. Each programme consists of an average of 60 frames and takes about one hour by an average learner to complete. Instructions for the use of the programmes by teachers and students are also presented in these booklets.

iii) Laboratory manuals.

To make the laboratory work a useful and meaningful activity, laboratory instruction sheets have been structured to take the students through a "guided discovery approach" to help them properly think and understand the methodology of experiments and the implication of their findings by thought-provoking questions at appropriate places.

5. Problems and constraints encountered and various strategies and methodologies adopted for solving them

a) Lack of sufficient funds. Rectified by careful planning and listing priorities for expenditures.

b) Shortage of equipment: Careful restructuring of the workshop practice schedules, so as to accommodate optimum number of trainees.

6. Future plans.

a) Starting more sandwich programmes.

b) Setting up more extension centres for the teacher training institutes and establishment of separate departments for educational research and educational management.

INDONESIA

1. Introduction

a) Educational system in Indonesia

i) General education

General education starts at the age of six. Primary education lasts six years, followed by three-year junior high school. Students who want to pursue higher academic courses enter three-year senior high schools. Tertiary education is provided at universities, institutes of technology, and other institutions, like polytechnics.

ii) Other types of education

At the senior-high-school level alongside the general education schools, there are a number of vocational and technical schools of three years' duration. Such type of schools are still in existence at the junior-high-school level, but those schools will be phased out, with the presumption that schools for general education at the junior high level will include in their programmes some pre-vocational subjects.

iii) Non-formal education

The Ministry of Manpower also conducts short courses of three to six months for out-of-school youth and for adults already employed. These courses are purely for skill training. Other ministries are also involved in providing educational programmes at the tertiary level for purposes limited to their own needs.

b) Organization and structure of vocational and technical education

Within the Ministry of Education, a Directorate for Vocational and Technical Education is charged with the responsibility to produce guidelines for the establishment and administration of schools for industry, home-economics and trade, various technical trades and handicrafts. These schools are job-oriented so that their graduates are expected to be able to enter the labour force or find gainful employment by other means, including self-employment. Admission to these schools is given to students who have passed the final examination of a three-year junior high school. Course duration is standardized at three years. This is justified by the fact that the programmes offered are educational in nature and not aimed at pure skill acquisition.

A four-year course is also provided for students graduating from the junior-high-school level to produce lower-level technicians for the mechanical engineering fields. For higher-level technicians, polytechnics provide courses of three years' duration for students graduating from the senior high schools. These polytechnics are administered by a directorate for higher education.

2. Curriculum planning in vocational and technical education

a) The specific objectives of senior secondary vocational and technical education are to prepare youth for useful employment. To translate these objectives into course content, the government has set up a committee comprising directorate officials, Unesco experts, senior teachers and people from industry or employers. Four categories of subjects are clearly recognizable:

i) basic subjects relating to the education of good citizens (20 per cent out of a total of 3600 clock-hours over three years);

ii) basic knowledge such as mathematics, science and English as required to understand technological principles (13 per cent);

iii) theory and trade knowledge related to skills (17 per cent);

iv) the skill training itself (50 per cent).

b) The main objectives of this skill training is to equip youth with the basic skills in a certain field of employment. In the field of mechanical engineering, for example, some of the metal trades students are attaining the following skills:

(1) The use of hand and measuring tools.

(2) The capability to read drawings based on the I.S.O. system.

(3) The use of cutting tools, and the use of the right speed in conjunction with machine-tools.

(4) The use of machine-tools in the production of machine parts with finish and dimensional accuracy to prescribed standards.

(5) The machining of different kinds of metals.

(6) The maintenance of tools, especially machine-tools.

(7) The welding of metals by the oxy-acetylene and electric-arc method.

(8) The fabrication of sheetmetal by bending and joining.

(9) The forging of small tools.

After acquiring these basic skills, the students will be able to further develop them within a minimum of time after they enter employment in their field of training.

c) The curriculum needs periodic revision, which needs to be made within the shortest time possible. At present, the government has not yet decided when to make the next revision. The present curriculum went into effect only in 1976. Information is compiled through a feedback system on how the curriculum works in actual practice. Information is also gathered on how the graduates are received by the industry through a special system.

d) Presently, a group of curriculum specialists, assisted by a team of Unesco experts, is engaged in developing curricula, syllabi and instructional materials for two technical teachers colleges to be opened in January 1980 in Padang and Yogyakarta.

e) Other Unesco experts and their counterparts are engaged in the same activities for the in-service training of teachers at the Technical Teachers' Upgrading Centre in Bandung.

3. The development of instructional materials

a) The various levels of teachers' competencies from all over the country make it impossible for the teachers from each school to develop their own instructional materials. The government is of the opinion that a centralized system will help in obtaining the same level of instruction throughout the country.

b) To this end, the government has set up a committee at the Technical Teachers' Upgrading Centre to develop job sheets for all trades and for all semesters. This task has been finished and job sheets are being distributed to all schools. For the practical training in the metal trades, for example, each job is accompanied by a job-sheet, so that students have a guide to learn in detail the proper sequence of steps to be taken before actually working on a piece of metal. An assessment sheet comes with each job-sheet, showing how the work of the student is to be evaluated.

c) The TTUC has its own media resource centre for the production of other instructional materials, like models, overhead projector transparencies, slides... etc., but it is still not fully operative.

d) At one time some of the teachers have been sent to a three months' course to learn the proper use and the production of slides and overhead projector transparencies. But obviously many of the teachers are not yet ready for this innovation, and not much use has been made of available projectors.

e) A directorate for educational facilities has recently been set up. At present this directorate is engaged in the production of textbooks.

4. Problems encountered and various strategies and methodologies developed for solving them.

The educational authorities are faced with a shortage of qualified teachers. Qualified workshop teachers and instructors should be recruited from the industry when they have mastered their trade and have at least three years' practical experience. Teachers with these qualifications are hard to find in Indonesia. The government hopes to solve this problem in stages.

The problems centre mostly around the difficulty of changing the attitude of teachers towards new work methods which are alien to them. Because of the rapid development of teaching methodologies, which have to be introduced within a relatively short time, the teachers have not enough opportunity to adapt themselves to these new methodologies.

Aiming to solve these problems, the Government started the re-training of teachers. A special education project - trying to solve the problem of shortage of qualified teachers - has started a programme for the re-training of in-service teachers. Through intensive course for skill training with duration of 1200 hours, it tries to achieve at least the minimum requirements to run the new workshops provided through loans from the World Bank.

This programme includes the following subjects:

- teaching methodologies	:	120 periods of 45 min.
- related theory	:	236 periods
- skill practice	:	1130 periods
- plant visits	:	114 periods
So that the total duration of the programme is	:	1600 periods which equals 1200 hours

5. Future plans

At this stage, the government intends to centralize the development and production of instructional materials at the TTUC and the two technical teacher faculties. These three institutions will be equipped with facilities so that the teachers will be able to effectively accomplish their tasks. In this they are assisted by the Unesco experts attached to the project.

JAPAN

1. Introduction

a) Educational system in Japan

- Compulsory education in Japan consists of six years of primary school (age 6-12 in public and private schools) and three years' lower secondary school, (age 12-15 in public and private schools). Ninety-four per cent of the lower-secondary-school students go on to further schooling.
- After nine years' compulsory education, (i.e. after graduating from lower secondary school), the students can choose from the following courses:
  - General high school (pre-university), or some of the following other courses of technical education:
    (1) Technical high school (upper secondary school), providing three years of technical education to provide general technical training;
    (2) Technical college, offering five years of technical education to provide higher technical training;
    (3) Vocational training school, with one or two-year vocational training in a specialized technical area;

After completing the general course of the upper secondary school, the students could continue their studies at:

(4) University, offering four years of technical education course to provide advanced level technical training; or

(5) Junior college, providing two years of technical education.

b) Organization and structure of vocational and technical education in Japan.

i) Technical education at secondary level.

Under the Education Law, technical education is provided and supervized by the Ministry of Education.

ii) Other vocational training.

Under the national plan of vocational training, this is provided by the Ministry of Labour. There are many courses developed by Local Governments with duration from 6 to 12 months.

iii) Technical university education could start:

- either at the age of 18, after 9 years' compulsory general education followed by three-year technical high school, in which case, the tertiary education starts from 'freshman' level and consists of six years of study;
- or at the age of 20, after 9 years' compulsory general education followed by five-year technical college, in which case the tertiary education starts from ' junior' level and consists of four years of study (the first two years undergraduate course, followed by two years' post-graduate course);
- Upon completion of their tertiary education, normally at the age of 24, the graduates have the option of three years' further study for doctor degree level - through post-graduate course. The postgraduate course aims at enrichment of highly specialized knowledge and development of practical and creative faculties necessary for leading engineers.

A new type of technical tertiary education in Japan is provided by the so-called 'new technological universities'. The educational system of a new technological university is entirely different from the traditional 'high school of engineering faculty of university' system of education. Unlike the traditional system of engineering education with departmental segmentation, the educational system in the new technological universities is inter-disciplinary. The chairs of the faculty members are composed into a cluster.

In order to realize the aim of new technological universities to foster practically-minded engineers, the practical and inter-disciplinary departments are widely developed, since technologists and scientists should be men of culture contributing to the development of science and technology.

2. Basic principles, strategies and methodologies, adopted in curriculum planning and instructional materials design

a) Technical education curricula contain a certain amount of general education subjects, which varies according to the type of institutions, as follows:

(1) Technical high schools

In technical high schools the number of general education subjects is larger than the number of technical education subjects. The number of credits to be earned for general education subjects is 53 to 57 and that in technical education 39 to 43. The total number of credits to be earned in the three years is 102.

(2) Technical colleges

In technical colleges the number of credits to be earned in technical education subjects is 92 credits, being larger than that earned in general education subjects, which is 85 credits. The students can graduate with a total of 167 credits, 75 of which in general education subjects and 82 credits in technical education subjects. Within those requirements, there is some room for choice of subjects in the curriculum. One characteristic of the curriculum for technical colleges is that each college is free to decide on the annual allotment of its technical education subjects to suit the nature and character of the college.

(3) Vocational training schools

In general, vocational training consists of 20 per cent general education subjects and 80 per cent practice in various technical trades.

In vocational training schools the curriculum is formed with a view toward producing skilled operators in various fields. For example, in the fields of architectural design, these include: architectural equipment, surveying, drawing, etc. The emphasis is on the number of training hours required to become a skilled operator.

(4) Technical university

The technical university offers a wide variety of subjects from which a student can make his choice. Each university forms its own curriculum.

b) Almost all technical education curricula are much the same, while vocational training varies according to the local demands.

c) High school curricula are evaluated by the Ministry of Education. Technical college and university curricula are evaluated by respective specialists - professors under the control of the Ministry of Education. Vocational training curricula are evaluated by the Ministry of Labour.

d) Vocational training school standards and the development of instructional materials are under guidelines set by the Ministry of Labour.

e) Technical high schools, technical colleges and universities have standards set and the development of instructional materials done by the Ministry of Education.

3. Main innovative features in the Japanese experiences

Although there are some differences in the educational goals of civil engineering and architecture compared to those of the other technical branches, there are some common innovations in this area, which are worth mentioning, since they occupy an important place in technical education and are also applicable in other areas:

(1) Remarkable progress is being made in construction technology today. There are new innovations and developments in construction methods, techniques and design. One of the tasks of technical education is to introduce these new technologies into the curriculum. For this purpose educational facilities are being upgraded by introducing audio-visual facilities and new experimental equipment.

(2) Today's construction technology is not limited to simple construction techniques but covers a wide area of subjects such as environmental control techniques, economics, ecology, etc. This calls for interdisciplinary curriculum as well as curriculum in which a student can choose subjects according to his own needs.

(3) Efforts are made to reduce handicaps due to school locations. In actual construction field study in today's curriculum, study topics and information on actual construction works and literature vary a great deal from school to school. To solve this problem, academic, industrial and educational circules have to co-operate closely in order to improve the relevant teaching materials.

(4) Technical education is greatly affected by the quality of its instructors. One of the aims of the new universities of technology is to re-train instructors, to help in an effort to provide the whole technical education with competent personnel. The new technology requires daily innovations and advances.

(5) More emphasis is laid on actual training and field work. Through this the student is oriented to acquiring actual technical skills and to deepen a sense of responsibility to his study. Repetitive training is more important factor than the total number of hours for training.

(6) Technological development is possible only when it is subject to constant review and appraisal, therefore the technical education curriculum has to include assessments of the results of technological advances.

4. Problems and constraints encountered in curriculum formation and various strategies and methodologies adopted in solving those problems

(1) Problems in technical high schools

Some of the problems in curriculum formation within the framework of 53 to 57 credits in general education and 39 to 43 credits in technical education, with a total of 102 credits in three years are as follows:

(a) Time limitations in both general education (particularly mathematics and English) and technical education (particularly in planning and design training).

(b) Due to the geographical location of each school, some schools are handicapped in curriculum formation concerning their field training and practical assignments.

(c) The curriculum is often too rigid to allow students to study about new technologies, skills and materials.

(2) Problems in technical colleges

Although the curriculum for technical colleges, which covers the period of five years, is more flexible than that for technical high school, there are still some problems:

(a) Some technical colleges are handicapped by their location in areas where field training, practical studies and research are difficult to achieve.

(b) In general, technical colleges do not have sufficient number of instructors qualified to the required level of technical education so as to produce intermediate-level technicians. Therefore, some curricula which are considered essential in the field of architecture and civil engineering, for instance, environmental technics, cannot be implemented.

(c) Due to limitations in time, budget and number of instructors, it is difficult to provide curriculum for some special studies that are essential for the college graduates (such as law and specifications concerning building and construction).

(3) Problems in university education

Although the curriculum at university level allows each university to develop its own characteristics, there are some problems in curriculum formation:

(a) Not enough improvements are made in educational facilities and experimental equipment in the universities so as to provide the students with adequate training. This affects, for example, the quality of education in the field of construction technology, which is becoming more diversified, automated and large-scaled.

(b) Not enough efforts are made to upgrade the educational personnel to increase the number of instructors and to strengthen the flow of educational information to cope with the fast developments in various fields, for example, construction technology.

(c) Since the university is a research institution as well as an educational institution, improvement in research facilities is usually given priority over improvement in educational facilities. This affects curriculum formation, which sometimes does not cover as wide a range as would be desired.

(4) Problems in vocational training

(a) How to improve the vocational education so as to be in line with the remarkable progress in technology.

(b) How to motivate students to become skilled craftsmen in a highly developed-cultural community.

(c) How to efficiently locate institutions which offer practical education and training in accordance with the local industries.

Methodologies adopted in solving some of those problems.

(a) Promoting renewal of curricula, institutional facilities and equipment through modernization.

(b) Improving the social conditions of the technicians and craftsmen.

(c) Developing special audiovisual methods and requiring academic institutions and industries to co-operate more closely.

5. Future plans

a) Improvement of vocational and technical education and training through providing better quality facilities.

b) More effective recruitment of students for vocational schools.

c) Establishment of new universities for retraining the teachers of technical and general education:

Technical Universities; Nagaoka and Toyohashi
Education Universities; Joetsu and Hyogo.

REPUBLIC OF KOREA

1. Introduction

a) Educational system in the country

The Central Board of Educational Policy is the policy-making body on important issues affecting education, while the Ministry of Education provides policy implementation, direction and supervision of educational administration, administrative acts and dispensations regarding all education. The ministry is also responsible for granting approval and authorization, for administration of educational personnel, and direction and supervision of all educational organs.

b) General education

The general system of education in the Republic of Korea comprises four stages: the primary, the lower secondary, the upper secondary and higher education forms.

These four stages correspond to the first to sixth grades (three years primary school), seventh to ninth grades (three years middle school) tenth to twelfth grades (three years high school) and thirteenth to sixteenth grades (college or university) respectively.

c) Other types of education

(1) Vocational high school

A vocational high school is a kind of regular high school which teaches curricula comprising vocational subjects in addition to the normal complement of general subjects, which devotes more time to the pursuit of specialized education.

There are eight main types of vocational high schools: agricultural, engineering, commercial, trades, consolidated, fisheries, marine, and arts.

(2) Higher education

The institutions of higher education are those providing classes for the 13th and higher grades. Commonly, institutions providing academic courses for the 13th through 14th grades are called junior colleges and those accommodating grades 13 to 16 are referred to as senior colleges. Above them are graduate schools providing master's and doctorate degree courses.

(a) College education

One hundred and twenty-seven special colleges offer four-year programmes in various fields. Colleges and universities in the Republic of Korea, like schools of lower grades, operate under strict enrolment limitations. Because of the gap between college admission limits and the number of aspirants, each school year produces a large number of 'repeaters', seeking college admission.

(b) Graduate school education

Admission to a graduate school is offered on a competitive basis to those who have acquired bachelor's degree by completing the normal four-year college course. Graduate schools train those graduate students who desire to pursue academic or professional careers.

(c) Junior vocational colleges

A number of two-year junior vocational colleges were set up in response to the rising demand for technical manpower in specialized fields. The junior vocational colleges developed from the former five-year junior technical colleges.

(3) Industrial education

Until the early 1960s the country's economy remained largely agrarian with a relatively small light industry sector. The implementation of a series of five-year plans transformed the whole economy, restructuring it with the rising

importance of heavy and chemical industries. The development of heavy and chemical industries, however, generated a rapid increase in demand for trained technical manpower. Under the revised educational system, the training of technical manpower is entrusted to three different levels, i.e., high schools, vocational colleges, and colleges or universities. Quite significant is the reorganization of previous five-year higher technical schools into two-year special colleges to turn out middle-grade engineering personnel.

(4) Technical education

(a) Technical high schools: The technical high schools are a primary source of technical manpower to feed the needs of the industry. The total of 95 technical high schools are classified into four major categories: mechanical, model technical, specialized technical and general technical high schools.

(b) Remodeling of junior technical colleges: Engineering students account for 60 per cent of total enrolments in the nationwide total of 127 junior colleges. This fact illustrates the importance of engineering in the curriculum of the entire junior college system. In anticipation of an explosive rise in the industry's requirement of medium-grade engineers, the government has enlarged the enrolment limits of junior technical colleges, at the same time raising qualification standards for both students and faculty members. For example, a would-be member of the faculty must be an MA degree holder.

(c) Specialized engineering college: The creation of a highly-trained technical manpower pool is vigorously being promoted in the knowledge that this will become the spear-head of economic progress in this country in the 1990s. Specialized engineering colleges have been established in response to this requirement.

A Specialized engineering college is organized and equipped by keeping the requirements of the region or the nearby industry in mind. While these specialized schools teach both the theoretical and practical aspects of the subject, special emphasis is placed on the installation of extensive laboratory and research facilities, in many cases with financial support or subsidy from the government.

d) Non-formal education

The non-formal education is of two types. One is the kind of para-institutional education given to those youths and adults who, in spite of the wide diffusion of school education in the modern society, have not had the benefit of formal education. The other is that designed to give short-term technical or refresher training to non-student population or those who are already employed.

2. Curriculum planning:

Curriculum revision in the Republic of Korea is made on a six-year cycle basis under the responsibility of the Ministry of Education. Curriculum development is research-based, which in general follows the stages:

(1) Basic studies: including philosophical studies on educational goals, analysis of national and social needs, and longitudinal population studies.

(2) Formulation of specific guidelines for curriculum development and articulation of educational goals by school level.

(3) Specification of educational objectives by grade and area of learning.

(4) Selection and organization of curriculum content and subject matter syllabus.

Evaluation is built-in at each stage so that judgemental and clinical data are collected throughout the whole process.

The structuring of the curriculum follows the process:

(1) first, KEDI prepares the curriculum draft,

(2) the draft is submitted to the Ministry of Education's Curriculum Deliberation committee for final review,

(3) the process of review is supplemented by public hearings, and

(4) the draft may undergo another cycle of modifications before it is adopted as a formal curriculum.

3. Instructional materials development

Instructional materials used mostly in the field of mechanical, civil, building subjects are developed as follows:

(1) The Ministry of Education conducts the compilation of a textbook according to the newly-established curriculum.

(2) The textbook is also refined and revised by the Bureau of Compilation of the Ministry of Education in order to keep up-to-date the level of technology and skills.

(3) The textbook is written and developed by professional teams in accordance with the Ministry of Education guidelines. Almost all of the technical high school students use the same textbooks which are compiled by the Ministry of Education at present.

(4) Various instructional sheets are developed by individual instructors as supplementary materials to the textbooks.

(5) The development of instructional sheets follows the processes:

(a) First some blocking of the material is done to make divisions of instruction;

(b) projects are analyzed for their basic operations;

(c) all related information is analyzed;

(d) operations and related information are arranged in instructional order;

(e) completing the analysis chart.

Instructional sheets such as operation sheets, job sheets, information sheets, and assignment sheets are made according to the unit.

4. Main innovative features in curriculum planning and instructional materials development

a) Curriculum planning

(1) Curriculum revision is made on a six-year cycle basis under the responsibility of the Ministry of Education.

(2) First KEDI prepares the curriculum draft, utilizing the knowledge and experience of leading specialists and educational researchers.

(3) The draft is submitted to the Ministry of Education's Curriculum Deliberation committee for final review which ensures that curriculum corresponds to the educational goals and objectives.

(4) The process of reviewing the curriculum is supplemented by public hearings.

(5) The Ministry of Education maintains a monitoring system to obtain feedback from the grassroots level.

b) Instructional materials development

(1) The method of instructional materials development and the methods of teaching in vocational-technical education field are taught in the in-service teacher training each year at the College of Industrial Education, Chung Nam National University.

(2) Ministry of Education conducts the compilation of textbooks according to newly-established curricula.

(3) Textbooks also are refined by the Bureau of Compilation of the Ministry of Education in order to ensure the implementation of up-to-date technology and skills.

5. Problems and constraints encountered in curriculum development

a) There is only one standard curriculum in the nation, so there is no provision for alternative curricula to meet the unique needs of local communities and pupils.

(1) KEDI is developing special programmes for compensatory and enrichment purposes.

(2) There is a need to develop alternative curricula designed to meet varying needs.

6. Future plans

When a curriculum is newly developed, all teachers in service must be trained to familiarize themselves with the new curriculum and its required teaching methods.

MALAYSIA

1. Introduction

a) Educational system in the country

i) General education

The general education system consists of six years of primary education, three years of lower secondary education and two years of upper secondary education. Two years of pre-university education and three to five years of university education may follow.

Students are streamed into arts, science, technical or vocational classes at the upper secondary level to enable them to pursue their learning in those fields of education that suit their capabilities and interests.

ii) Other types of education

Outside the formal school system, further education classes play important roles. Further education classes are government-sponsored and aim at providing opportunities to those who can't continue their education in the normal school system. Correspondence education is conducted entirely by private institutions.

b) Organization and structure of vocational and technical education in the country

i) Craft/vocational courses

The secondary vocational schools aim at providing a two-year vocational training combined with basic education in science, mathematics, languages and practical subjects. They are to provide the industrial sector with manpower equipped with basic skills and knowledge. The entry requirement is the completion of lower secondary education. On successful completion of the course, students find employment as craftsmen.

ii) Technical courses

The polytechnics provide two years of training for engineering technicians. The entry qualification is either the Malaysian Certificate of Education or the Malaysian Certificate of Vocational Education.

2. Basic principles, strategies and methodologies adopted in curriculum planning

a) Vocational and technical education curricula aim at fulfilling the needs of the employment sectors as well as the developmental needs of the individuals. They provide both vocational skill training as well as general studies.

b) In secondary vocational schools, 20 per cent of the available time is devoted to general subjects and 71 per cent to vocational training, which consists of 30 per cent theory and 70 per cent practice. On-the-job training is optional in the vocational schools while in the polytechnics it is compulsory.

c) There is no difference between vocational education programmes offered in urban areas and those in rural areas.

d) Curriculum evaluation is done by:

i) assessing students' performance,
ii) assessing teaching-learning resources, and
iii) assessing the graduates' performance.

3. Strategies, methodologies and instructional arrangements used in the development of various instructional materials

a) Instructional materials commonly used in all the vocational and technical courses are: job sheets, information sheets, assignment sheets, wall charts, specimens, mock-ups, models, real objects etc.

b) The factors taken into consideration in the development of instructional materials are: the characteristics of the learners and the availability of resources and trained personnel.

c) At present, the development of instructional materials is the concern of individual institutions.

4. Main innovative features in the country's experiences in curriculum planning and instructional materials development

The curriculum for vocational skills, which is at present undergoing a revision, adopts a new document in which student learning outcomes are clearly stated in specific objectives. The document clearly describes the content, the recommended activities, the necessary teaching aids and the time allocation for each topic. The new document will assist the instructors in their teaching and in the techniques of evaluation.

5. Problems and constraints encountered and various strategies and methodologies adopted in solving those problems

a) Technical and vocational education is comparatively new in the country and intensive programmes for its expansion began only a few years ago. In implementing these programmes, the country faced various problems and constraints:

i) Lack of trained personnel in the areas of curriculum development and instructional material design.

ii) Inability to obtain sufficient in-plant training places for students due to the geographical location of the schools.

b) In solving these problems the Technical and Vocational Education Division of the Ministry of Education has taken the following steps:

i) Organizing personnel training schemes and conducting in-service courses.

ii) Intensifying the efforts to get industry's involvement in implementing the in-plant training of the students.

6. Future plans

To meet the country's need for skilled manpower in implementing the five-year development plans, the expansion of vocational and technical education is a necessity. In the mid-term review of the Third Malaysian Plan (1976-1980) 24 new secondary vocational schools and five more polytechnics have been approved for construction. In addition, short-term courses in various engineering trades at the existing Secondary Vocational Schools have also been planned.

PAKISTAN

1. General education

General education starts at the age of 5, followed by five years of primary school and five years of secondary school. Those who want to continue can have a two-year college education if they pass an entrance examination. If they pass the final examination at the end of a two-year college education, they are also eligible to enter the graduate programme in the universities.

2. Other types of education

Secondary school graduates with good marks in technical subjects are eligible to enter the three-year diploma course in the polytechnics. Those who satisfactorily pass the eighth grade are eligible to seek admission to vocational institutes for two-year training courses.

3. Non-formal education

The Ministry of Labour and Manpower is responsible for arranging apprenticeship training programmes, usually during the weekends. The courses offered are purely skill-training.

4. Organization and structure of vocational and technical education

A directorate in the Ministry of Education is responsible for the control and administration of vocational and technical education and to produce guidelines for establishment of schools and institutes preparing technical manpower for industries and trades.

5. Curriculum planning

The curricula for mechanical and civil/building subjects are designed according to the needs and the technological changes in the industry. For this purpose the Ministry of Education appoints a council of technical experts and field engineers to investigate the various aspects of curriculum and to make the necessary amendments according to the changing requirements of the industry.

Four categories of subjects are included in the curricula:

a) General knowledge subjects: 4 per cent;

b) Basic science subjects: 6 per cent;

c) Special technical subjects: 20 per cent; (related to the skills to be taught);

d) Practical skill training: 70 perccent.

Strong emphases are placed on skill training. Three full days per week are allocated for that purpose. The main objective of this training is to equip the trainees with those basic skills that are required in the field of their future employment.

It is understood that each curriculum needs periodic revision but it is not easy to be achieved in a short time. At present the Government of Pakistan has set up a council of technical education to make necessary revisions in the curriculum and to bring it into conformity with the changing requirements of the industry and the socio-economic needs of the country.

6. Development of instructional materials

At present various lecture-notes are being extensively used, although some textbooks and other reference books have been prescribed. But since most of them pertain to engineering degree courses, it is difficult to use these books. To a great extent these lecture-notes are inadequate in many respects and their quality varies from teacher to teacher and institution to institution.

The ability of teachers to develop their own instructional materials varies from person to person and from institute to institute. It is very difficult to develop a centralized system of instructional materials in Pakistan. Keeping in view the need for development of

instructional materials as an important factor in technical education, this task was assigned to the teacher training institutes attached to the polytechnics.

A lot of instructional materials which include information sheets, job sheets, display charts and models have already been developed and are being extensively used by teachers with day-to-day improvement of the old instructional materials.

7. Key innovative features in curriculum planning and instructional materials development

Since the curricula, syllabi and duration of vocational courses offered by various technical training institutes in Pakistan were not uniform and the training imparted in these courses were not in conformity with the changing requirements of the industry, the National Committee on technical education decided that uniform curricula of vocational courses should be developed for the whole country in the light of the education policy for the period 1972-1980.

The project was entrusted to the Punjab Board of Technical Education, Lahore, to make a detailed on-the-spot survey of all vocational training institutes in the four provinces of the country. The information collected through this survey regarding physical facilities available at courses offered, standard of training and staff pattern was the basis for further work on a project. As a result of this exercise, the following courses in mechanical subjects were developed as models:

(1) Mechanical craftsman
(2) Machinist
(3) Refrigeration and air-conditioning mechanic
(4) Die-making
(5) Auto-diesel mechanic.

In addition to the survey, six volumes of workshop mannuals were also compiled for the following courses:

(1) Mechanical (one volume)
(2) Auto diesel (two volumes)
(3) Air-conditioning and refrigeration (three volumes)

The model courses have been proposed keeping in view the principle that the abilities of the personnel and the job requirements in modern industrial enterprise are closely related to the contemporary scientific and engineering development. This involves the use of new materials, new processes and new methods of production and work which require certain abilities of the technician and highly-developed skills in order to perform his functions properly.

8. Problems and constraints encountered

In Pakistan there is:

a) A lack of special technical teacher training institutions that are needed to change teachers' attitudes toward modern methods of teaching;

b) A need for evaluation of the effectiveness of technical and vocational education at the national level;

c) a shortage of textbooks and manuals prepared according to course contents;

d) irrelevance of the curriculum to the rapid technological changes in the industry;

e) a need for standardization of materials to be used in all institutions, and

f) a lack of co-ordination between the various teachers' methods of teaching technical subjects and the preparation of relevant instructional materials matching those different methods of teaching.

9. Future plans

a) To establish more technical schools;

b) to improve the facilities and standards of teaching; and

c) training of more technicians and engineers in accordance with the changing needs of the industry and the socio-economic needs of the country.

PHILIPPINES

1. Introduction

a) Educational system in the country

The National Board of Education is the policy-making body of the Philippine Educational System while the Ministry of Education and Culture is the implementing agency. Under the Ministry are the Bureau of Secondary Education and the Bureau of Higher Education which directly control the education offered by both public and private institutions. The general education consists of six years' elementary level, followed by four years of secondary level after which a student can go to a college.

b) Organization and structure of the vocational and technical education in the country

The main purpose of vocational and technical education is to prepare the individual for useful employment and to meet the national developmental needs. The entry age qualification is 14 years of age. In line with its main purpose, vocational and technical education have three major objectives:

i) To provide pre-service training in the basic manipulative skills, related technical knowledge, proper and safe working habits, and other related information necessary for employment in some trade and industrial pursuits;

ii) to provide in-service training and extension of educational opportunities for the purpose of upgrading some working skills, technical knowledge and providing related information, for persons already employed in the industries, thus helping them to obtain a higher position, and

iii) to provide training to middle level technicians who will work between the craftsmen and the engineers.

c) The entry requirements for the secondary institutions are graduation from the elementary schools, physical and mental fitness, and passing the entrance examination. In some secondary schools (Schools of Arts and Trades), the technical/vocational education generally starts at the secondary or high school level. Thus the Schools of Arts and Trades provide a secondary trade technical education programme. There is at least one trade school in each of the 52 provinces of the Philippines. Some provinces have two or more trade schools - depending on the area and population of the region.

For the first two years in high school or secondary education the students have basic workshop practice, most of which is related to woodwork, metalwork and electricity.

During the last two years, the students are given the options to choose among the specialized workshops in about twenty-one different trades.

In the post-secondary or technical schools, an applicant must qualify through an admission test. In addition, he must be a graduate of a secondary school; must be at least 16 years of age, possessing good mental and physical health; and must demonstrate some interest in the selected field of training. For the college level (four or five years' curricula), an applicant has to pass the National College Entrance Examination (NCEE) in addition to the above requirements. For admission to the short-term courses, particularly those given by the National Manpower and Youth Council, one must be out-of-school youth and at least 17 years of age, or an unemployed adult, preferably high school graduate. He or she must be physically fit, must pass the entrance examination and obtain a police or NBI clearance.

2. Curriculum planning and development

a) The following types of curricula for vocational and technical education have been prepared:

- Two-year trade-technical education curriculum (post-graduate);
- three-year technician curriculum (at junior college level);
- four-year industrial curriculum (Bachelor of science in industrial education);
- five-year engineering;
- for short specialized vocational courses, the duration differs from one to another.

b) Variety of courses offered, their final product and job-employment opportunities resulting from the implementation of the above listed curricula:

- Craft courses - semi-skilled workers;
- Vocational courses - skilled workers;
- Technical courses - skilled workers;

- Craft instructors training - teachers, instructors;
- Technician teachers' training - teachers/instructors.

There are always adequate job opportunities for the graduates of all above-listed courses.

c) Basic principles, strategies and methodologies adopted in curriculum planning for technical and vocational education.

Technical and vocational education (for mechanical and civil/building subjects) are related to the needs of the society in general and the industry in particular. They are, therefore, influenced by the social and economic developmental factors in the country.

Priorities are determined at the national level and the system is designed according to certain national policies. Consideration is given to the special characteristics of the educational programmes for technicians, the availability of resources and the types of staff available.

The ratio of the time allotment for related theory and practice, including in-plant training, is 50-50 per cent. In the process of preparation and evaluation of the curriculum, people from the industry, instructors conducting the relevant course, and curriculum specialists work in close co-operation.

3. Strategies, methodologies and institutional arrangements used in the development of various instructional materials

a) The following varieties of instructional materials are being used in technical and vocational education:

i) various printed materials:
   - instructional sheets, job sheets, operation sheets, information sheets and check sheets (evaluation sheet); workbooks, textbooks, lesson plans and printed modular meterial*; instructional manuals (on how to use the machines and equipment), etc.;

ii) various visual aids and devices for direct display:
   - flip charts, shop organization charts, progress charts;
   - posters: safety posters, health posters, etc.;

iii) models, simulators* and mock-ups and prototypes;

iv) software materials for projection:
   - slides, transparencies for overhead projector.

Note: materials marked with an asterisk(*) are not very widely used.

b) Factors taken into consideration in the development of instructional materials.

i) Teachers' initiative and ability to prepare such materials;

ii) number of students (size of a class);

iii) school policy;

iv) teachers' creativity and innovative approaches;

v) availability of supplies and materials;

vi) time allotment for teachers for self-preparation and for research work.

c) Centralization and institutionalized production of instructional materials.

At present there is a centre in charge of the preparation of instructional materials for the secondary schools in practical arts. At the Technological University of the Philippines the Research and Development Centre is in the process of institutionalizing the production of instructional materials. A curriculum development centre for practical arts was also established at the Technological University of the Philippines. They have developed teaching guides in various courses, such as woodwork, metalwork, electrical work, electronics, automotive mechanics, graphic arts, etc. - for the secondary schools. They have also developed loose-bound instructional materials in the absence of textbooks.

4. Main innovative features in the country experiences in curriculum planning and instructional materials development

- Ladder type of education;
- regular meeting of industry representatives and educators to work on the revision of curriculum;
- introduction of instructional modules;
- use of video tape recorders;
- adoption of a production scheme for the students;
- introduction of check-sheets in mechanical subjects for the students' evaluation.

5. Problems and constraints encountered and strategies adopted for solving them

a) In general:

- Non-recognition of the role of the technicians in the industry;
- lack of adequate equipment and facilities;
- insufficient in-plant training of the technical students;
- no standard curriculum.

b) More particularly:

i) In the building trades:

- The problem that hinders most building construction in the country is the high cost of building materials and labour. Similarly, in the training centres, the major problems are lack of modern facilities such as concrete mixers and testing equipment and the limited supply of building materials.

- A builder in an urban area does not need to be an experienced jack-of-all-trades or to possess all the various skills of different types of builders. Usually, at a building site there is the carpenter who works on the wooden structure of the buildings; the door and window case makers, the built-in cabinet maker, the mason, the plumber, the sheet-metal worker, the house electro-technician, the painter, and many others. However, at a small building construction like those in the rural areas, the builder or carpenter is more likely to do all the different jobs.

ii) In the mechanical trades:

- As is the case of other developing countries, in spite of the large number of surplus engineering graduates being produced by the Technical Colleges in the Philippines each year, there exists an acute shortage of manpower having practical technical capabilities.

The National Polytechnic System is a counter-measure to this urgent problem.

In the secondary trade education, the third-year high school students' workshop practice consists of general metal work. The students are supposed to spend 15 hours per week for 40 weeks continuously in a year. This is so because the school year in the country is not divided into semesters.

The following steps are adopted in solving some of these problems:

- attempts for closer relationship and co-ordination with the industry;
- assistance from foreign sources and from the local industries;
- scheme to implement additional 240 hours of in-plant training during the summer vacation period;
- establishment of a national polytechnic system.

6. Future plans

- Mass production and distribution of instructional materials for practical arts in the secondary schools throughout the country.
- Standardization of curricula for technical and vocational education with the necessary provisions for its flexibility.

SRI LANKA

1. Introduction

a) General education starts at the age of 6 and consists of five years of primary education, followed by four years of secondary education, and three years of higher secondary education.

b) Vocational education at trade level and craftsman level

After passing the Junior School Certificate (8th grade), a student is entitled to enter a Junior Technical Institute (J.T.I.), where he follows a two-year craft-level course. The age entry requirement is 18 years of age.

c) Technician level of technical education

i) The entry requirement for polytechnic institutes is G.C.E. - ordinary level, with credits in science subjects.

ii) The duration of a technician level course is three years or more, on successful completion of which a student can get employment as a technician either in the governmental or in the private sector.

iii) The three years of training consists of two years at the polytechnic institute and one year of in-plant training,or on-the-job training provided by the National Apprenticeship Board.

d) Training of technical teachers and instructors

This training is provided by the Technical Teacher and Instructor Training Institute at the University of Moratuwa - Sri Lanka.

The entry requirements for this category are:

i) Successful completion of a technician level course.

ii) Minimum of five years of industrial experience.

e) Other types of vocational and technical education

i) The National Apprenticeship Scheme provides vocational-trade-level training and technician-level training.

In addition to these, the National Apprenticeship Scheme also provides in-plant training for technicians graduated from technical institutes and for the under-graduates who follow training in technical fields. This training is of one year duration. Presently, the National Apprenticeship Scheme has courses for 145 different crafts and nine special apprentice courses aimed at preparing the trainees to meet the requirements of the industry. In addition to these, the National Apprenticeship Scheme provides in-plant training to students from technical institutes and the university.

ii) Some organizations from the private sector and from the public sector provide craft level training. This type of training is intended to meet the great demand for craftsmen caused by the current exodus of technical manpower to foreign countries. The curricula and teaching methods adopted by these organizations are designed so as to meet the national developmental needs and the requirements of the industries.

f) Various types of institutional training for civil/building engineering trades.

i) Out of the six universities in Sri Lanka, two, namely, the Peradeniya University, and the Moratuwa University, provide civil/building subjects for undergraduate and post-graduate courses.

ii) Peradeniya University has undergraduate courses in civil engineering whereas the Moratuwa University has undergraduate and postgraduate courses for civil engineering, environment, architecture and town and country planning.

iii) Moratuwa University provides full-time courses for technician-level students (National Diploma in Technology) in civil/building subjects. Hardy Senior Technical Institute too provides courses in civil/building subjects for technician-level courses. Curricula in both places are the same for Technician-level courses.

iv) Moratuwa University provides part-time courses in civil/building subjects for those employed in relevant fields. The technical institutes (viz. polytechnic institutes and junior technical institutes) situated in various parts of the country provide courses in civil/building subjects to those employed in the relevant fields.

v) Junior technical institutes and some polytechnic institutes provide full-time vocational courses in building subjects such as carpentry and building trades. Courses such as plumbing, bar bending, concrete and form-work-making are some of the part-time courses provided for vocational-level students in some of those technical institutes.

vi) Some government departments and corporations provide training in civil/building subjects to technician and trade level students. Curricula adopted by these organizations vary from place to place. They train individuals in order to meet their needs and requirements. Some of the government departments which produce this type of trainee are listed below.

- Ceylon Transport Board
- Railway Department
- Irrigation Department
- Port Commission

- Telecommunications Department
- Survey Department
- Highways Department and so on.

vii) The Labour Department has its own training centres in many parts of the island and provides short courses to train masons and carpenters.

viii) Many private sector companies and voluntary and religious organizations have various types of training schemes to produce specially carpenters, masons, concreters etc. They adopt various types of curricula and innovative techniques to produce these workers in the shortest possible time.

ix) Some of the voluntary organizations which train building workers are listed below:

- Sarvodaya Movement
- Lions Club
- Rotary Club
- Ceylon Chamber of Commerce
- Religious Organizations etc.

2. Curriculum planning

i) Curriculum planning is done by the individual institutes (Junior Technical Institutes and the Polytechnic Institute) according to the guidelines provided by the Curriculum Development Centre and the Technical Teacher and Instructor Training Institute at the University of Moratuwa, Sri Lanka.

ii) The planning of curriculum for craft-level courses is based on a job analysis of the particular trade.

iii) The Education Department at the Ministry of Education entrusts the design of the curriculum to a core of experienced educators and representatives from the industry.

iv) In order to meet the changing needs of technological development, the curricula and syllabi are regularly revised.

3. Problems and constraints encountered in curriculum development and strategies adopted to rectify some of the problems

i) The older forms of training craftsmen were found not to be adequate for the expanding industrial ventures in Sri Lanka. Skilled workmen were trained through the old method of the apprentice working under a reputed master-craftsman for a number of years, learning a particular trade under his guidance. There was no established curriculum or specific method followed by these master-craftsmen.

ii) Up to 1978 the statistics in connection with the apprenticeship scheme were not properly documented. At the beginning of 1978 the National Apprenticeship Board (N.A.B.) appointed a qualified statistician who was responsible for collecting and documenting all data related to this project.

iii) At the beginning of the scheme the funds allocated to the project were insufficient for the successful running of the N.A.B. But in the year 1978 the present government allocated 19 million rupees for the N.A.B. This amount was increased to quite a substantial sum in 1979, which is approximately 2½ times the amount allocated in 1978, reaching the amount of 42 million rupees approximately.

4. Main innovative features

i) Retraining of technical teachers to update their knowledge and experience in accordance with the latest developments in their fields of speciality (recently introduced in the country).

ii) Introduction of in-plant training for technicians and university undergraduates through the National Apprenticeship Scheme.

iii) Periodic revision of the curriculum with the active participation of the curriculum development centre, and the Technical Teachers and Instructors Training Institute, in consultation with specialists from the industry.

iv) In order to meet the increasing needs of the country for qualified technical manpower, intensive training is provided by 203 establishments in the private sector and 108 in the public sector. A country-wide instructional programme has been organized to give related theoretical instruction to 145 trades categorized at craft level and eight areas of engineering at special apprentice level.

v) The National Apprenticeship programme has developed the technical and vocational training in Sri Lanka. Maximum community participation and optimum use of community resources helped the National Apprenticeship Board to carry out this programme with minimum expenses. The whole scheme was an innovative feature which changed the age-old pattern of producing craftsmen by traditional methods. The N.A.B. introduced formal methods of training skilled craftsmen to suit the indigenous conditions prevailing in Sri Lanka by adopting new curricula and shortening the unnecessarily long process of training.

vi) Another innovative feature adopted recently by the N.A.B. is the change of curriculum in a number of crafts and the introduction of situational apprenticeship, where the training is carried out according to the requirements of each industrial establishment. Finally,

the N.A.B. is keen to adopt new techniques to improve the training of technical manpower in Sri Lanka and is presently investigating and experimenting to introduce shorter and more effective methods of producing skilled craftsmen and technicians to suit the present requirements of the country.

vii) The Department of Civil Engineering and Surveying at the University of Moratuwa, Katubedde, conducts full-time courses at professional and technician levels. It also conducts part-time post-graduate courses leading to M. Eng. degree and also conducts part-time certificate and apprentice courses under the University extension service. Facilities for research at undergraduate and postgraduate levels are available.

viii) Research is an increasingly important aspect of the work of the department of architecture. In the B.Sc. course students learn the basic techniques of acquiring and compiling information, while in the M.Sc. course students do advanced research under the guidance of an experienced tutor.

5. Future plans

i) To provide special training to those workshop demonstrators who have been recruited from the industries in order to improve their pedagogical background.

ii) Standardization of curricula in all technical institutes throughout the country.

iii) The government intends to retrain the in-service technical teachers at the Junior Technical Institutes and the Polytechnic Institutes through the Technical Teachers and Instructors Training Institute, University of Moratuwa, Sri Lanka.

CHAPTER II

SYNTHESIS OF COUNTRY EXPERIENCES*

1. Introduction

a) Educational systems in participants' countries

i) All participants' countries appear to have similar educational systems with general education comprising five to six years of primary (elementary) education, followed by lower secondary (middle school) education and higher secondary (senior school) education with different duration. While in Bangladesh, India and Pakistan after five years of primary-level schooling the students go to another five years of lower secondary education, in Sri Lanka they go to four years' lower secondary education. In Indonesia, Japan, Republic of Korea, Malaysia and the Philippines the primary (elementary) level is six years followed by three years' lower secondary education, except the Philippines where it is four years. In the Republic of Korea the first six years of schooling are divided into three years' primary and three years' middle school.

ii) While in Bangladesh, India, Pakistan and the Philippines the youths may enter technical or vocational courses after 10 years of general education, in Indonesia, Japan, Republic of Korea and Sri Lanka, these courses start after nine years of schooling.

Japan may be quoted as offering three kinds of technical/vocational education after the first nine years of general education: either three years' technical high school, or five years' technical college, or one to two years' vocational school.

b) In general, the training of technical manpower for the mechanical trades or for civil/building trades, could be categorized as follows:

i) It takes from 10 to 12 years to train skilled workers (craftsmen, tradesmen);

---

* Note: When summarizing the experiences of the countries represented at the Technical Working Group Meeting, the participants based these syntheses not only on the country papers presented at the meeting, but also on the basis of their observations and findings made during the visits to some institutions and projects in the host country, listed in the attached Annex VII. The participants developed and utilized a special format for compiling information and data during these visits which is enclosed as Annex VIII, and all their observations and findings during the visits are presented in the Reports on the Field Visits, attached as Annex IX.

ii) It takes from 13 to 15 years to train technicians (the linking cadres between the skilled workers and the engineers). Those are in great demand and, with exception of Japan, there is a notable shortage of technicians both in mechanical and in civil/building trades, so as to meet the demands of the present technological development of the countries;

iii) It takes from 15 to 17 years to produce mechanical engineers at B.Sc. level, or civil/building engineers and architects at the same level.

c) In both mechanical engineering field and civil/building engineering field the narrow specialization in some particular trades is similar to one another in most of the countries, so that:

i) the mechanical engineering trades could be grouped into the following categories: blacksmith, fitter, pattern maker, moulder, grinder, lathe-operator (turner) tool-maker, machinist, welder (gas and electric), plumber, die-fitter, automotive mechanic, sheetmetal mechanic, draughtsman, etc.

ii) The civil/building trades could be categorized in the following specialities: surveyor, hydromechanic, road-builder, soil-mechanic, mason, brick layer, carpenter, cabinet maker, welder, plumber, draughtsman, etc.

d) Various types of non-formal education for mechanical and civil/building trades in most of the countries is conducted and organized by a wide range of training institutes, and manpower development centres.

e) While in some of the represented countries the technical and vocational courses for mechanical and civil/building trades are terminal, in other countries ladder-type technical education is provided, leading to graduate level.

f) In most of the countries represented at the meeting, usually the vocational training is under the Ministry of Labour, or Ministry of Industrial Development, while the technician education is under a special department or directorate within the Ministry of Education. However, the technical and vocational education in some of the countries is decentralized so that it is organized, controlled and supervized by local governments.

The following summary, presented in tabular form, compares the entry qualifications, the duration of courses, and the main aims and objectives of vocational and technical education courses with indication of the final product and job opportunities after the training.

Summary: Vocational and Technical Education in Some Asian counties with a view to the final product and job opportunities

(as per information available. The asterisk • indicates how easy it would be to get a job)

Countries	Entry qualification	Duration of courses	Aims and objectives	Final product and job opportunities					
				Craft courses	Vocational courses	Technical courses	Craft Instructors Training	Technician Teachers' Training	Remarks
Bangladesh	For vocational education - after 8 years of schooling	2 years	To produce craftsmen and skilled workers	Skilled craftsmen in wood working, plumbing, masonry, etc.	Skilled workers, as carpenter, mason, fitter, plumber, etc. •) not easy				Lack of qualified technical teachers and instructors
	For technician education - after 10 years of schooling	3 years	To produce technicians who occupy intermediate position between engineers and craftsmen	Civil, building, survey, farm technology technicians		Specialists like supervisor, manager, etc. •)fairly easy			
India	For vocational education - after 10 years of schooling	2 years	To produce skilled workers for the industries	Skilled workers for the industries	Machine operators	Specialists, like supervisor, junior engineer, etc.	•)The graduates easily get an instructor's job		
	For technician education-after 10 years of schooling	3 years	To produce middle-level technicians					No problem for providing training opportunities for teacher training	
Indonesia	For vocational education - upon graduation from junior high schools (after 9 years of schooling)	3 years	To equip students with basic skills for the industries	Operators for the service industries	Semi-skilled workers	Foremen, engineering and production technicians	Instructors at vocational schools •)easy to get job	Teachers for lower level technician schools - always in demand	Industries offer competitive salaries to technical teachers
	For technician education - the same requirements	3 years	To prepare technicians for the industries		Craftsmen				
Japan	For vocational training - after 9 years of schooling	1-2 years	To produce skilled workers	1 year training in vocational school and on-the-job training craftsmen in various firms	Great variety of courses with different duration from 6 months to 1 year	Only through technical education with 3-5 years duration	Becoming instructors after graduation of technical college or technical high school, students undergo 4 years of training	Technical college under the Ministry of Education or university of technology provide technical teacher training	
	For technical high school - after 9 years of schooling and entrance examination	3 years	To produce middle-level technicians						
	For technical college - after 9 years of schooling and entrance examination	5 years	To produce high-level technicians able to assume supervisory positions						

Countries	Entry qualification	Duration of courses	Aims and objectives	Final product and job opportunities					
				Craft courses	Vocational Courses	Technical courses	Craft Instructors Training	Technician Teachers Training	Remarks
Republic of Korea	For vocational education - after 9 years of formal education or equivalent qualification	1-2 years	To produce class II craftsmen (in the case of vocational training institutes)	Semi-skilled workers	Work as machine operators (after 1-2 years training)	Skilled workers or junior technicians (after 3 years' education)	becoming instructors after 2 years of training - after secondary education	Becoming teachers after 4 years of training - after secondary education	
	For technician education - after 9 years of schooling and selection through entrance examination	3 years	To produce junior technicians (in the case of technical high schools)	*)Slim job opportunities	*)Almost all are employed		*)Fairly easy to get instructor's job	These courses are in great demand	It is difficult to get technical teachers
Malaysia	For vocational education - after completing lower secondary education	2 years	To train craftsmen and skilled workers	Skilled workers for building, mechanical trades	Skilled craftsmen for building, mechanical trades		Instructors for building and mechanical trades are in great demand	Teachers and lectures *)easy to get job	
	For technician education - after completing upper secondary education (MCE + SPVM)	2 years	To produce technicians			Technicians and/or supervisors			
Pakistan	For vocational education after 8 years of schooling	2 years	To produce craftsmen and skilled workers	Skilled workers for mechanical, woodwork jobs, welders etc.	Machine operators, draftsmen, etc.	Foremen, supervisors, managers			
	For 3 years - diploma course at polytechnic - 10 years of schooling	3 years	To produce technicians						
Philippines	For vocational education - after 10 years	2 years	To train craftsmen for useful employment	Semi-skilled like wood carving, bricklaying, etc. Electrical, mechanic, civil/building etc.	Skilled workers mechanic/ craftsmen *)easy to get job	Various middle level specialists in mechanical or civil/building trades, such as surveying technicians etc.	Demonstrators and instructors	Highly qualified teachers	All technical education in the Philippines was oriented towards higher degree leading to "white collar jobs"; this is at present being rectified
	For technician education - after 10 years schooling	3 years	To produce technicians who occupy intermediate position between engineers and craftsmen						
	For technical education after 13 years	3 years	Training engineers who will supervise the technicians and craftsmen						

Countries	Entry qualification	Duration of courses	Aims and objectives	Final product and job opportunities					
				Craft courses	Vocational courses	Technical courses	Craft Instructors Training	Technical Teachers Training	Remarks
Sri Lanka	For vocational education - after 10 years of schooling	2 years	To produce skilled workers	Semi-skilled workers in building trades	Semi-skilled workers	Technical supervisors			
	For technician education - after 13 years of schooling	3 years	To produce middle-level technicians	Craftsmen for civil/building, or mechanical trades	Skilled craftsmen, foremen	*)easy to get job	Demonstrators - after ten years of experience as skilled workers or craftsmen	Becoming Teachers after obtaining technician's certificate and 5 years' experience in industry	

47

2. Basic principles, strategies and methodologies in curriculum planning

a) The main objectives of curriculum planning for the various mechanical and civil/buildings trades, are:

i) Development of skills for the purposes of national development;

ii) Various factors, influencing individual student's and teacher's development are also considered in planning developing, revising and modifying the curricula;

iii) Basically, the curriculum planning is reflecting the industrial and governmental development policies.

b) Curriculum planning, theoretical concepts and methodologies based on them:

i) All countries except Indonesia have clearly stated theoretical concepts and respective methodologies adopted;

ii) The curriculum planning in all countries reflects the developmental policy and community needs of the country, but some countries also reflect concerns to industrial and technological progress;

iii) Generally, all countries undertake their curriculum planning on similar basis but the actual curriculum planning differs from country to country, due to each country's physical facilities and specific social and economic conditions.

c) In most of the countries, the curricula are developed for mechanical and civil/building subjects on the basis of certain principles, through similar phases, which include:

i) Planning phase - incorporating various activities, like study of technicians' job; job analysis to identify the necessary knowledge, skills and attitudes; entry behaviour of the students;

ii) Development phase - during which curriculum is developed through the following activities:

- specification of course content;
- developing respective syllabi;
- defining theory/practice ratio within each syllabus;
- concentrating on each topic of the syllabus with a view to its relation to the educational objectives of the curriculum, to which this particular topic, subject or syllabus belongs;
- final selection and organization of curriculum content and subject matter syllabus.

iii) Curriculum evaluation is done by:

- assessing students' performance;
- assessing teaching-learning resources; and
- assessing the graduates' performance.

3. Strategies, methodologies and institutional arrangements used in the development of various instructional materials

a) The main strategies used in the development of instructional materials for mechanical and civil/building subjects are common for most of the countries represented at the meeting. They may be summarized as follows:

i) The instructional materials in the various countries differ little from one another;

ii) Generally each country follows certain guidelines for the development of instructional materials, while in some countries the entire responsibility for their development is centralized under one agency.

b) The methodologies used in the development of instructional materials vary from country to country. It was established that:

i) Some countries have specialized organizations to develop methodologies for production of instructional materials;

ii) Some countries lack established methodologies for instructional materials development.

c) In all participating countries the most commonly used instructional materials for the mechanical and civil/building technical courses are: job sheets, information sheets, instructional manuals, modular materials, assignment sheets, wall charts, specimens, mock-ups, models, real objects etc.

d) In most of the participating countries the development of instructional materials is based on the following factors: the characteristics of the learners, and the availability of resources and trained teaching personnel.

e) In many of the participating countries the technical teachers and the workshop instructors are the main source for developing instructional materials related to the narrow field of their technical subjects, for which they require special training.

i) The methods of instructional materials development in the respective technical education field are taught in the in-service teacher training courses, or prior to commencing their teaching career in almost all participating countries;

ii) Since in some countries many of the present technical teachers and workshop instructors are lacking such knowledge and experience (being recruited directly from the industry, without proper pre-service teacher training), special upgrading and in-service training courses are devoted to rectify this problem;

iii) In some countries, like Indonesia, for example, it is considered that the various levels of teacher's competencies from all over the country make it impossible for the teachers to develop their own instructional materials. The government is of the opinion that a centralized system will help better in obtaining the same quality of instructional materials and it has set up a committee at the Technical Teachers' Upgrading Centre to develop job sheets for all trades and for all semesters. The centrally-produced job sheets have been distributed to all schools for the practical training in the metal trades in Indonesia.

f) Some countries, like India, for example, have introduced item banks as instructional materials for classroom use. For instance, the following item banks have been produced at the Technical Teachers Training Institute (Southern Region), Madras: survey; applied mechanics; strength of materials; structural engineering; public health engineering; hydraulics and hydraulic machinery; construction management.

g) Establishment of instructional resource centres.

i) In some of the participating countries a variety of instructional materials have been produced and distributed by those centres. Recently some of the instructional resource centres in India, for example, have produced various multimedia learning packages for a number of special mechanical and civil/building technical subjects;

ii) In some of the countries various instructional manuals have been prepared by the instructional resource centres to give details regarding the objectives, demonstration techniques and construction of some of the selected static and dynamic models.

iii) Some of the instructional resource centres promoted the production and use of special learning packages. In India, for example, a number of learning packages for civil/building subjects have been developed by experienced teachers of polytechnics with the guidance of staff members of the civil engineering faculty of the Technical Teachers Training Institute, Madras.

h) Promotion of local educational film production.

In some of the participating countries the production of special educational films for mechanical or civil/building technical subjects is centralized, while in some other countries this film production is organized on local basis.

4. Main innovative features in the countries' experiences in curriculum planning and instructional materials development for mechanical and civil/building subjects

(1) Almost all the countries participating in the T.W.G. Meeting have centralized agencies for curriculum planning and development, which ensure the participation of various industries in the curriculum development process.

(2) Some countries have planned special curricula for new types of courses for some civil/building trades such as sandwich courses, for instance India, Pakistan and Malaysia.

(3) Some kinds of instructional materials for a number of mechanical engineering subjects, like item banks, multimedia kits, etc., are also being centrally developed, for instance in Japan, Republic of Korea, India and Pakistan.

(4) Some countries have introduced in-plant apprenticeship training schemes as part of their training programmes, and developed the relevant curricula.

(5) Short-term and long-term technical teacher training programmes, including acquiring of industrial experience, more particularly for some mechanical trades, are being organized in most of the participating countries.

(6) Skills development in certain mechanical trades has been stimulated through special industrial practice that helps the degree of accuracy required, like the use of the check sheets and inspection sheets by the students for their own evaluation of accuracy as part of the quality control, e.g. in Japan, Republic of Korea, etc.

(7) Some countries, like India, Philippines and Sri Lanka, have introduced periodical revision of the curriculum with the active participation of the curriculum development centre, and the Technical Teachers and Instructors Training Institute, in consultation with specialists from the industry.

(8) In some countries, like Sri Lanka, for example, great emphasis is placed on optimum community participation and full use of community resources in the implementation of the apprenticeship training programme with minimum expenses.

(9) Some countries, like India, have established community polytechnics to serve the regions within the country. For example, certain polytechnics in every state have been selected as community polytechnics and the Government of India has granted considerable aid for the development of these institutions. Making use of locally available resources, special curricula for some elective subjects have been developed.

(10) Some of the participating countries have introduced the development of instructional materials for modern methods and techniques, such as team teaching, laboratory-centred instruction and the project method.

(11) For many of the participating countries a new development is the introduction of special laboratory manuals.

To make the laboratory work a useful and meaningful activity, laboratory instruction sheets have been structured to take the students through a "guided discovery approach" to help them to think constructively and to understand the methodology of experiments and the implication of their findings by thought-provoking questions at appropriate places.

(12) Some countries, like India, Republic of Korea, Japan, and the Philippines, use videotape recording for specific instruction on some sequence of operations in various mechanical trades.

(13) For mastering some manipulative skills and achieving high quality production corresponding to certain precision requirements and specifications, some countries, like Republic of Korea, Japan, and the Philippines have introduced the use of special check-sheets in a number of mechanical subjects for students' self-evaluation.

(14) Another innovative feature, adopted recently by Sri Lanka N.A.B. is the change of the curriculum for a number of crafts and the introduction of situational apprenticeship, where the training is carried out according to the requirements of each industrial establishment.

(15) For some countries, like Sri Lanka, for example, a new innovative feature is the introduction of in-plant training for technicians and university undergraduates through the National Apprenticeship Scheme, which requires special new curricula and instructional materials.

5. Problems and constraints encountered and various strategies and methodologies adopted in solving those problems

a) General comments

The problems and constraints in curricula and instructional materials development for mechanical and civil/building subjects faced by most of the developing countries in Asia and Oceania are common and are related mainly to the relevancy of the content of the curricula offered, the proper utilization of equipment, the efficiency of the curriculum evaluation systems, the liaison with the industries, future employers as well as alumni and other associations.

Since most of these problems and constraints are directly or indirectly related to the planning and implementation of the curricula, they could not be isolated or ignored in the present report.

Most of the member countries have successfully solved many of their problems in accordance with their own socio-economic and developmental needs and it is hoped that these experiences would help to generate solutions for similar problems faced by others.

b) Some problems and their solutions.

(1) Shortage of trained personnel to implement the curricula and to achieve the educational objectives set for these particular subjects.

i) Generally, there is a shortage of trained teachers and instructors for the mechanical and building trades in all of the countries participating in the T.W.G. Meeting;

ii) Some of the countries have overcome this shortage by offering in-service training programmes, correspondence-cum-contact programmes, industrial education and training programmes, for which relevant special curricula have been prepared.

(2) Lack of teachers' awareness of the real industrial problems.

i) In order to overcome this lack of experience, teachers are exposed to various industrial problems by sending them to the industries for specified periods. As a result they improve not only their knowledge and experience, but also their instructional materials, illustrating them by relevant examples from the industries.

ii) Organizing discussion of critical issues and problems with industrialists through seminars and symposia also reflects on curriculum designing in the light of the needs of the industries.

For example, implementation of new technological processes in various mechanical trades, or introduction of mechanised building methods and automatization of production processes have been subjects of such discussions.

iii) The lack of contemporary practical industrial experience of some of the teachers is jeopardizing the effective updating of curriculum content in accordance with the present technological progress.

In attempting to rectify this problem, various strategies have been implemented in some of the countries:

(a) Practical industrial experience and professional upgrading is provided by sending teachers periodically to specified industrial enterprises depending upon the specific needs of institutions.

(b) The short term attachments of teachers to industrial enterprises exposes them to the existing real-life situations, which will be the actual future environment of their students, and these practices usually result in updating of the instructional materials.

(3) Shortage of appropriate facilities and adequate equipment necessary for practical implementation of the curricula.

i) Generally, with the exception of Japan and partly Republic of Korea, there is a shortage of adequate facilities and equipment needed for efficient training in most of the mechanical trades, and to a lesser extent in the civil/building trades.

ii) While some countries have tried to develop low-cost technical equipment, other countries have tried to allocate additional funds to purchase the necessary quantity of adequate quality equipment, namely: more precise machine tools, laboratory instruments and modern machines. These two different approaches are also influencing the curriculum and syllabus content which must be based on the availability of training facilities and equipment.

iii) A few countries have approached some international funding agencies for loans, some countries, bilateral aid programmes, and some countries have asked for assistance from their own local industries.

(4) Training, based on the existing old, obsolete equipment.

i) In general, the equipment used for mechanical trades training and some of the building techniques in most of the participating countries is old and outdated. This inevitably affects to a certain extent the curriculum and syllabus content, as well as its implementation.

ii) Many countries have tried to modernize some techniques and to modify the existing equipment or to replace it by new equipment, updating the curriculum and syllabus content accordingly. While in the area of some civil/building technical subjects this is more easily achievable, in most of the mechanical specialized subjects, it is impossible through improvisations, unless new, more sophisticated machinery and equipment is acquired and installed.

(5) While some countries like India, Japan, Sri Lanka and Republic of Korea have established instructional resource centres within many of their institutions, in the other countries this is not practised.

(6) Shortage of printed appropriate instructional materials such as textbooks for many of the mechanical and civil/building special subjects, as well as other instructional materials like work sheets, job sheets, instruction manuals, modular materials for many of those subjects.

i) All participating countries have a centrally-organized system of designing, developing and distributing instructional materials such as handouts, printed notes, guides and textbooks, for some more common technical subjects, like technical drawing, building and architectural drawing, general and applied mechanics, strength of materials, woodwork joinery, some basic metal workshop practices like fitting, welding, sheetmetal, foundry, plumbing, etc.;

ii) Much more is needed for more narrowly-specialized technical subjects, introducing new techniques and technological processes;

iii) In some countries the transition period for implementation of the international system of units and the change from the imperial system of units to the metric system varies and this brings additional difficulties in developing up-to-date instructional materials.

(7) Shortage of educational films made specially for mechanical and civil/building technical subjects.

i) Generally speaking, there is a shortage of educational films for these technical subjects, where many manipulative skills and sequence of operations could be best demonstrated through this medium.

ii) Some of the countries have established central film library systems while a few countries, like Japan and Republic of Korea, have their own educational broadcasting systems in full-time operation.

(8) Lack of adequate orientation through feeder courses to technical education

i) Almost all countries represented in the meeting have some feeder courses, but many of them are ineffective to orient appropriate candidates towards mechanical or civil/building trades.

ii) A proper orientation is attempted in some countries by administering special admission tests and induction programmes.

iii) Some countries feed all the information required through pamphlets, brochures and mass media.

(9) Theory-based examinations determine the curriculum content and the qualification of the technical manpower. Only a few countries place more emphasis on the degree of practical skills development, while the other countries conduct theoretical and practical examination separately, over-emphasizing the theoretical knowledge, which affects the curriculum content and structure as well as the qualification of their graduates.

(10) Lack of student interest and motivation.

i) All of the participating countries have attempted to motivate the students in acquiring practical skills and knowledge in the respective subject areas by providing modern facilities and proper environments and by tailoring their curricula for those technical subjects accordingly.

ii) Some countries are trying to motivate the learners by undertaking production-oriented workshop practice, on-the-job training and other appropriate projects for which specific instructional materials are required and need to be further developed.

(11) Omission of important contemporary industrial and technological processes and various production techniques in the curriculum and syllabi.

i) In the field of some mechanical subjects, some countries have supplemented these omissions by organizing special lectures, seminars, field visits, while some other countries rectify these omissions by organizing on-the-job training, industrial attachments, etc. Each of these two approaches requires different curriculum content respectively.

ii) In the field of some civil/building subjects besides the various special lectures, seminars, field trips etc., some countries involve the students in practical work related to the immediate environment, e.g. building of roads, fences, school buildings, etc. aiming to improve the campus facilities.

(12) Inadequate production of special instructional materials for slow learners.

i) Slow learners are helped by providing them with additional time through remedial courses, more individual attention, or supplying them with programmed or semi-programmed instructional materials and multi-media packages.

ii) The best and most successful approach proved to be the development of individualized, self-paced learning materials.

(13) Some regional developmental needs of the local industries or building enterprises are not fully met by the local technical educational institutions.

i) The specific regional needs are met more or less by many of the institutions located in urban areas.

ii) Most of the training institutions preparing technical manpower for various mechanical or civil/building trades are located mainly in industrial areas and only a very few community polytechnics are established to serve the needs of rural areas. Their curricula are tailored according to the local rural community needs.

(14) In some countries vocational and technician courses for mechanical and civil/building trades are terminal.

Many of the participating countries have provided opportunities for upward mobility through some special courses, part-time courses and regular courses,having developed respective curricula for each one of them, while in a few countries some of these courses are terminal and do not provide further opportunities for higher degree of specialization. This necessitates very careful curriculum planning which should not handicap those trainees.

(15) In some countries the lack of proper or fully comprehensive job descriptions of the employees in various industrial branches frequently presents an obstacle to proper curriculum planning.

While proper job descriptions are available in a few countries, e.g. India, Japan and Republic of Korea, other countries are now attempting to collect data through various questionnaires, interviews and industrial visits. The information collected in this way provides an adequate background for proper design of curricula and syllabi for each particular trade in the field of mechanical or civil/building professions.

(16) Some syllabi in these two subject areas are not sufficiently detailed. Only few of the participating countries have attempted to provide clear objectives and to prepare respective guidelines for curriculum planning, so as to avoid creating syllabi which are lacking sufficiently detailed content.

(17) Lack of sufficient co-ordination between theoretical instruction and practical training.

i) While some countries are facing this problem due to the lack of such co-ordination in their curricula, some other countries, like India have developed laboratory-centred courses, attempting to solve this problem.

ii) Some other countries with more advanced industrial development and adequate facilities and equipment, like Japan and Republic of Korea, have developed workshop classrooms, where the training in some mechanical trades is performed through integrated theory and practice.

(18) The lack of adequate allocation of time for some special subjects is affecting the proper implementation of the curriculum.

i) In some of the participating countries this factor is not recognized as causing a problem in view of the present pace of their industrial development.

ii) In some other countries the lack of adequate time allocation for the implementation of the respective curricula is causing problems, which are partially rectified by providing additional school hours, provision of weekend classes and time re-scheduling. These approaches have been considered only as temporary solutions to the problem, until some newly revised curricula are implemented.

(19) Difficulty or delay in providing feedback information from graduated students and their employers jeopardizes timely revision and modification of the curricula.

i) Generally, there is no organized system of getting such feedback information in any of the participating countries.

ii) In some isolated cases information from some alumni, associations and from employers is collected and used as feedback for the curriculum planners, but it is not established on a regular basis.

6. Future plans

a) In general, the most common future plans of the participating countries could be summarized as follows:

(1) Establishment of technical schools and polytechnics in rural areas that are needed to promote the boom of local economy.

(2) Improvement of facilities and equipment corresponding to the new technological process and its requirements for multi-skilled technical manpower.

(3) Curriculum standardization and improvement in the system of production of instructional materials.

(4) Re-training and upgrading of technical teachers and instructors to familiarize them with new methods and techniques for designing, producing, and properly utilizing a greater variety of instructional materials.

b) In particular, the future plans, as outlined for each country by its participants of the meeting, are presented in the following form:

Future Plans

BANGLADESH	INDIA	INDONESIA
1. To set up a college of engineering offering three years Bachelor's degree course in mechanical and civil/building engineering, with the aims: a) to provide higher education opportunities for the graduates of technician courses, which had been terminal till now; b) by providing opportunities for further studies this provision will attract students of better calibre to the Polytechnic Institutes.	1. To prepare special educational films for mechanical and civil/building trades. 2. To prepare multimedia packages for the respective subjects. 3. To establish educational research centres. 4. To establish educational management departments. 5. To start sandwich courses in industrially-oriented courses. 6. To establish more instructional resource centres.	1. To increase the capacity for centralized production of printed instructional materials for mechanical and civil /building technical subjects. 2. To establish media resource centres at two Technical Teachers Upgrading Centres for the development of various instructional materials for these subjects, like slides, transparencies, wall charts, etc.

1. Further improvement of facilities related to mechanical and civil/ building new technologies. 2. Increase of the enrolment for these trades in Technical and Vocational Institutions, according to the needs of the industries. 3. Introducing more effective recruitment of appropriate candidates for the vocational schools. 4. Establishment of more specialized technical universities. 5. Training of more engineers as teachers for the proposed new universities.	1. Further improvement of the curriculum for the mechanical and civil/building subjects in vocational technical education. 2. Establishment of new vocational/ technical education systems according to the needs of the industries. 3. Promotion of the status of technicians and skilled workers in the industry, aiming to attract better students to the technical field.	1. Expansion of system of vocational and technical schools, aiming to meet the country's need for skilled manpower according to the Five-Year Development Plans. 2. To establish 24 new secondary vocational schools and five new polytechnics which have been approved in the Third Malaysian Plan (1976-80). 3. To start new short-term courses in various mechanical and civil/building engineering trades within the existing secondary vocational schools system.

PAKISTAN	PHILIPPINES	SRI LANKA
1. To establish more technical schools with courses in mechanical and civil/building trades according to the needs for the country development. 2. To improve the facilities and standards of teaching. 3. To improve qualitatively and quantitatively the training of skilled workers, technicians and engineers for the present needs of the industries.	1. To introduce standardization of curricula for technical and vocational education with provision for flexibility. 2. To organize the mass production and distribution of instructional materials for practical arts in secondary schools throughout the country. 3. To develop a complete house building plan for low-cost housing unit utilizing local materials. 4. To exchange scholars in the field of mechanical and civil/ building fields, with some other countries.	1. To retrain and upgrade the in-service technical teachers working at Junior Technical Institutes and Polytechnic Institutes through the Technical Teacher and Instructor Training Institute at the University of Moratuwa. 2. To organize retraining of technicians and craftsmen in accordance with the new technology. 3. To introduce standardization of the curricula for mechanical and civil/building subjects in the various technical institutes.

CHAPTER III

SUGGESTIONS FOR DEVELOPMENT OF CURRICULUM AND INSTRUCTIONAL MATERIALS FOR MECHANICAL AND CIVIL/BUILDING SUBJECTS IN VOCATIONAL AND TECHNICAL EDUCATION

I. Suggestions for development of curriculum in vocational and technical education

Introduction

Each country, each society must organize its educational system in accordance with its own needs, aspirations and traditions. Nevertheless, there are several trends, patterns and goals to which virtually all subscribe.

In order to become more productive and efficient, vocational and technician education and training should be co-ordinated with the state of industrial and commercial development and the economic resources of the country as a whole.

Hence in the process of curriculum planning and development, the following suggestions are offered for the formulation of educational objectives:

1. Formulation of educational objectives

a) Reliable estimates of the demand for craftsmen and technicians for the mechanical and civil/building trades based on a systematic survey of the actual technical manpower needs of the countries development plans have to be undertaken on a regional, statewise and national basis in terms of different types of technicians, branches of technologies and special fields. Also, their distribution among industries, commercial organizations, public utilities and other sectors of employment should be projected on the basis of some studies undertaken by institutes of applied manpower research, etc. These studies can help immensely in evolving suitable guidelines for curriculum planning and development for each particular field, including the field of mechanical and civil/building trades.

b) The participants of the T.W.G. Meeting for curriculum planning and instructional materials development for the mechanical and civil/building trades propose the following actions to be undertaken:

(1) Each country should organize a system of vocational and technical education in accordance with its socio-economic needs, the occupational needs of its citizens, and the emerging needs of new technologies.

(2) The educational development needs of the skilled mechanical and building workers and technicians at all levels in the industrial manpower structure should be systematically identified on a national scale.

(3) Institutions offering training in mechanical trades/subjects should identify the actual needs of industries/firms and government enterprises.

(4) All instructional activities should be designed to be appropriate to the trainees' level and correspond to the needs of the industry and should also provide such wide knowledge and spectrum of skills that would contribute towards mobility and adaptability of the learners in the future.

(5) Basic science, mathematics and other general subjects should be well-proportioned and integrated to meet the comprehensive and continuing educational needs of the individual to enable him to acquire the knowledge provided in the special mechanical and building/civil technical subjects.

(6) The achievement standards should be specified in a manner which readily lends itself to periodic evaluation of the curriculum.

(7) Specific objectives for each particular subject should be formulated by expert bodies comprised of scientists, educators, educational planners, administrators, industrialists, engineers, architects and other specialists in such a way that achievements are measurable after completion of the course.

2. Curriculum development - existing policies and practices

a) While the need for expanding the facilities for vocational and technician training for building up a sound and stable technological society has been accepted by all participating countries, the degree of expansion of these facilities has not kept pace with the technological development in those countries.

Also, the policy and practice adopted for curriculum design and development in many of the countries have not been flexible enough to cope with the changing needs of their economic growth and national development.

b) The following factors are suggested for consideration and review of the existing policies and practices:

(1) Though the general trend appears to be centralized planning of the curriculum, it is felt that some flexibility at the institutional level for special courses would be desirable.

(2) Formation of advisory committees or councils in selected fields (e.g. mechanical subjects) should be given due importance in view of the emerging needs of the industries posed by the introduction of new technology.

(3) Adequate funding and resource mobilization for effective implementation should be ensured.

(4) Modern methods and techniques of instruction through utilization of various audio-visual aids, better-qualified teachers, proper student selection procedures and other means must be considered in detail for each particular trade.

(5) The curriculum content for each special technical subject should be made flexible enough to:

i) meet the needs of the community;

ii) meet the requirements of the prevailing industry in the region;

iii) keep abreast with the changes in technology.

(6) Proper organization and structuring of the curriculum should be achieved in order to meet the output demands, both qualitatively and quantitatively.

(7) On-the-job training/apprenticeship training should form an important component of all technical training for the mechanical and civil/building trades.

(8) Different strategies such as sandwich programmes, day release, block-release, part-time courses etc., should be adopted to meet the concrete need for trained manpower at all levels.

3. Curriculum implementation

a) Any curriculum, however well it may be developed, needs active support and participation of trained teachers, good methods and techniques of instruction, proper evaluation schemes, close co-operation from industry and responsive learners.

b) After the curriculum is developed and refined, the following suggestions are proposed for adoption and implementation:

(1) Analysis of the proper sequencing of curricula content, observing the particular instructional objectives and preparation of teaching schemes have to be undertaken.

(2) Evaluation techniques have to be prescribed along with examination schemes so as to meet specified instructional objectives.

(3) The theoretical and practical parts of each curriculum have to be integrated.

(4) Active co-operation of industry has to be ensured, especially in areas of work-study in some mechanical and building trades.

(5) Schemes for industrial familiarization and gaining of practical experience by technical teachers and instructors are essential for the successful implementation of the curriculum.

(6) In-service workshops, special seminars, etc. to acquaint the teachers with new curricula should be organized.

(7) Modern innovational techniques and methods, such as team teaching laboratory, centred instruction and so on, should be adopted wherever appropriate to the course content of the respective mechanical and civil/ building subjects.

(8) Adequate infrastructure facilities in the form of buildings, equipment and instructional materials should be provided opportunely.

4. Curriculum evaluation

a) Evaluation is considered as a process adopted to gather evidence of the relevance and attainment of objectives, forming judgement on the basis of that evidence and weighing of that evidence in the light of the objectives. The judgement may be framed against a set of criteria or norms such as stated objectives. Hence evaluation becomes an integral, ongoing process up to the implementation of the curriculum, to bring about the necessary changes on the basis of feedback information received.

b) Considering the many components of the curriculum, such as objectives, course content and its organization, teaching and learning activities, classroom and institutional management, instructional materials and so on, in order to achieve a meaningful evaluation, the gathering of evidence in the functioning of each of these components is essential, so that their strength and weaknesses are brought to light for necessary improvement.

c) The following suggestions for modifications may be considered for adoption:

(1) Mechanism to obtain feedback information regarding the performance of the output of the system, namely the work of the craftsmen and technicians should be evolved on a regular basis.

(2) Revision and reorganization of curriculum content in the light of the above feedback have to be done.

(3) The establishment of criteria for national standards of performance is desirable.

(4) All instructional methods and media have to be regularly reviewed and reorganized.

(5) The system of admission and selection procedures of technical students needs modification.

(6) All technical teachers and instructors need retraining according to the changing needs of the curriculum.

(7) Updating of knowledge and skills and upgrading of equipment should go hand in hand with the development of new technologies.

(8) Institutions of excellence, both government and non-government, should be recognized and rewarded.

5. Specific suggestions for the development of curriculum in the area of mechanical subjects.

a) In broad terms, the planning of curriculum for various mechanical subjects has the following specific objectives:

i) To link education with productivity;

ii) To make students more employment-worthy with the ultimate aim of making them capable of self-employment, if the need arises.

iii) To provide the students with essential occupational background and familiarity with the tools, materials, processes and 'technological knowledge';

iv) To provide more broad-based occupational experience rather than training for a specific job, with a view to making available to students as many avenues as possible after termination of education.

b) The basic guiding factor in providing a wide choice of courses should be as follows:

i) To cater to the varied aptitudes and interests of the students;

ii) To meet the requirements of schools as needed viz. Regional Diversities;

The following is a typical illustrative example of courses to be offered in the field of mechanical trades:

(1) Tool design
(2) Tool and die-making
(3) Tool-room operating training
(4) Metrology and inspection
(5) Heat treatment
(6) Machine-tool maintenance (stage I & II)
(7) Electrical maintenance
(8) Advanced welding
(9) Production technology
(10) Industrial chemistry.

c) The curriculum design of a course should specify the course duration, minimum entrance qualifications, objectives of the course and scope of the course, indicating the number of hours required. Then an outline of the course content should clearly specify the content of the theory of the respective trade technology and the trade practice, after which the method of instruction should be explained in detail. This is illustrated by a typical suggested example for the second of the above-listed courses:

(1)	Course	:	Tool and die-making
(2)	Duration	:	12 weeks (480 hrs.) full-time course
(3)	Entrance qualification (minimum)	:	Apprenticeship in tool maker, fitter or machinist trade followed by two years' industrial experience in the trade
(4)	Course objectives	:	To train machinists to a standard which will enable them to produce simple jigs and fixtures, press tools and form dies.
(5)	Scope of course	:	1. Trade technology(theory) 40 hrs. 2. Trade practice and shop floor instructions 440 hrs.
			Total 480 hrs.

(6) Outline of the course content :

(a) Theory of the trade technology:

Fundamentals of jigs and fixtures, press tools and forming die technology. Basic principles of tool and die-making and job layout. Sequences of work steps. Selection of steels and background information about heat treatment. Principles of gauge making. Use and construction of work-holding devices for simple operations. Tool-room machining processes as applied to conventional machines and to jig-boring, jig-grinding, profile-grinding, die-sinking, spark erosion and pantograph engraving, workshop safety.

(b) Trade practice:

Practice in welding, marking and die filing. Finishing of various components for press tools, jigs, fixtures or forming dies and their assembly. Workshop and tool-room inspection techniques. Demonstration followed by operation of conventional tool-room machines. (Practice in machining components). Completion of specific projects (press tools, jigs, fixtures or forming dies) to suit the need of the sponsoring firm.

(7) Methods of instruction:

These include theoretical lectures, demonstrations, workshop instruction (such as on theory of workshop calculations, composition of steels, heat treatment data, etc.), group discussions, practical exercises and individual projects. The trainee must be assessed on his performance periodically and has to face a final test. Use of visual aids, individual guidance, industrial visits and lectures by industrial experts on special topics must be part of this training programme.

d) The curriculum designed in the above-suggested manner ought to be experimented, critically evaluated and regularly revised, amended and updated in accordance with the new technological developments and changes in the respective industrial processes.

6. Specific suggestions for the development of curriculum in the area of civil/building subjects

a) Process of curriculum planning

(1) The following points should be considered as general terms for curriculum development:

(a) Philosophical study of educational points;
(b) National technical education policy;
(c) Social and national needs of the country related to building trades.

(2) Based on the above basic points, the process of curriculum development should be organized in five phases:

(a) Planning phase;
(b) Development phase;
(c) Improvement phase;
(d) Implementation phase;
(e) Evaluation phase.

(a) Planning phase

During this initial phase the following major points have to be considered:

i) The country's needs and future national development programmes;
ii) the aims of the training course;
iii) what are the prospective technicians/skilled workers' jobs in this particular trade and a detailed job analysis of each narrowly-specialised job, e.g. bar-bending, bricklaying, plastering, building, carpentry, construction/formwork, construction/joinery, electrical wiring, masonry, painting, plumbing/pipe fitting, etc.
iv) what theoretical knowledge and practical skills are required of the technicians/skilled workers performing these specified jobs;
v) the entry behaviour of students;
vi) what are the actual local demands;
vii) the local available resources;
viii) the present trends in the development of building technology.

(b) Development phase

During this phase the following points should be considered:

i) Identification of specific objectives;
ii) identification of course content;
iii) catering to the local demands;
iv) following the progress of technology; and
v) developing the educational infrastructures.

(c) Improvement phase

The curriculum should be constantly improved on the basis of regular revision and evaluation, taking into consideration the following points:

i) Feedback of students' performance at the training institutions;
ii) feedback from industries on their changing requirements;

iii) feedback and evaluation of students' performance in the industries or building sites, wherever they are employed after graduation, or even feedback information on their performance during some on-the-job training practice during the course of their study.

(d) Curriculum implementation

Before the implementation of the curriculum starts, the following factors should be identified:

i) The course contents that have to be covered;
ii) the teaching strategies which are to be employed;
iii) the teaching-learning methods that are going to be implemented;
iv) what are the available instructional resources; and
v) what is the time required for each topic of a particular syllabus within that curriculum.

(e) Curriculum evaluation

The following points should be considered in the process of the evaluation of a curriculum:

i) The output should meet the needs of the industry;
ii) the curriculum should meet the defined objectives of the course;
iii) the curriculum should meet the national educational goals

- Methodology of evaluation

A variety of methods may be employed in the process of curriculum evaluation:

i) Circulation of detailed questionnaires;
ii) discussion with employers and employees;
iii) interview of employers and alumni; and other methods.

Each method of evaluation has to be based on some criteria of measurable objectives, and the composition of the respective questionnaires requires team efforts of educational evaluators, curriculum planners, field specialists, scientists and administrators who may form a body with overall responsibility and supervisory functions, while the discussions and interviews with the respective parties (employers, employees, alumni, etc.) could be entrusted to separate working teams of evaluators.

The two working groups-for mechanical and for civil/building subjects - examined some of the countries' experiences in evaluation of various curricula for those subjects, and on the basis of the analyses of these experiences, amalgamated their two proposals in the following suggested methodology for assessment of curriculum.

This assessment incorporates:

i) Research work

- The prepared curriculum should be assessed through research work, related to the specific subject matter;

- Appropriate research personnel should be specially trained on how to evaluate the respective curriculum of vocational and technician education special subjects.
- Statistical techniques should be used to correlate the performance of the learners to the new curriculum.
- All research findings regarding the curriculum, collected through field practice, the new methodologies, and related knowledge, should be incorporated into the new revised curriculum.

ii) Experimentation

- The curriculum relating to interdisciplinary areas should be assessed through special experimentation.
- The curriculum should be assessed by a team of teachers in the respective subjects, research workers, scientists, and policy makers.
- Selected institutions should experiment the new curriculum.

iii) The participants of the T.W.G. Meeting proposed the following check list for the evaluation of the curriculum.

The following questions could help in evaluating the curriculum:

- Whether the objectives are properly formulated.
- Whether the course content of the curriculum reflects the expectation of the curriculum planners.
- Whether the course content is presented in the logical sequence of the subject matter.
- Whether the curriculum reflects the present and the future trends of technological development.
- Whether the teaching-learning methods are clearly stated.
- Whether the recommended resource materials are easily available to implement the curriculum.
- Whether the students' achievement in the training institution could meet the needs of the industries and fulfil the objectives of the curriculum.
- Whether the entry behaviour of the students is taken into consideration.
- Whether the estimated time is sufficient to achieve the objectives.
- Whether a proper balance between theory and practice is maintained throughout the whole curriculum.

b) Implementation of curriculum

The participants expressed their concern that however perfect a curriculum could be, its proper practical implementation is vitally important for the achievement of its educational objectives. To a very great extent this depends on the selection and adoption of the most appropriate instructional techniques and methods for each specific teaching/learning situation.

(1) The adoption of instructional techniques and methods should be based on the availability of resources and adaptability of the country.

(2) Team teaching should be experimented within certain branches of vocational technician education, like mechanical trades, building trades, etc.

(3) Laboratory-centred instruction should be adopted to integrate theory and practice in all technical subjects that are related to laboratory method, e.g. applied mechanics, strength of materials, technical chemistry, metallurgy, building materials technology, etc.

II. Suggestions for development of instructional materials in vocational and technical education

1. Introduction

a) The participants of the meeting, summarizing their findings and observations of various general problems and factors made the following suggestions:

(1) Existing policies must be reviewed and new policies must be evolved for large scale development and use of instructional materials at all levels.

(2) Adequate funds and support for development of instructional materials in every technical training institution should be provided by the respective governments and other agencies.

(3) Ways and means of placing more emphasis on the practical implementation of educational technology as a part of the technical teacher training programmes should be found.

(4) Special measures must be taken to train qualified staff and proper incentives must be given to the development of appropriate instructional materials related to the respective field.

(5) More emphasis should be placed on the development of indigenous low cost materials utilizing available local resources rather than relying on commercially-available expensive and sophisticated materials and equipment.

(6) The identification and selection of proper instructional materials for each topic of every syllabus should be observed during the process of curriculum development for different subjects.

(7) Special seminars, conferences and workshops must be organized periodically for educational planners, administrators and teacher educators to assist them to appreciate and realize the importance of the appropriate instructional materials.

(8) Institutional resource centres in every institution of technical training should be organized, where special instructional materials are designed, developed and made readily available to every teacher.

(9) Attempts should be made in every country to develop software and hardware in accordance with the prevailing facilities and local conditions.

(10) Educational institutions and other agencies should organize conferences, seminars and exhibitions to promote exchange of information and experiences of successful use of new instructional materials among teachers of specific technical subjects.

(11) The newly-developed instructional materials should be tested to see if they are appropriate to the learning abilities of the learners.

(12) A communication system for mutual exchange of information regarding instructional materials among the member countries should be established on a permanent basis.

(13) Every country should make efforts to establish an instruction materials bank for utilization on national scale and for international dissemination of information and co-operation. At the initial stage, preference should be given to subjects with common content, and preferably requiring more graphical presentation and less text.

2. Suggestions for development of instructional materials

a) Strategies and methodologies

The strategies and methodologies which are recommended to be adopted for development of instructional materials involve the following steps:

(1) Identification of needs,
(2) Identification of target audience,
(3) Identification of objectives,
(4) Identification of skills, procedures and techniques,
(5) Identification of approaches,
(6) Identification of necessary raw materials,
(7) Identification of manpower involved,

(8) Production of samples or prototypes,
(9) Testing and evaluation,
(10) Modification,
(11) Final production.

b) Variety of instructional materials for the mechanical and civil/building subjects.

(1) Printed materials

(a) Textbooks for all mechanical and civil/building trades should be prepared centrally for such basic technical subjects that are common for different streams. Usually the textbooks in mathematics, physics, chemistry, mechanics, machine technology, strength of materials, technical drawing, etc. fall into this category of common subjects. This would ensure their good quality and inexpensive production in great quantities.

(b) Other printed materials, such as textbooks, instruction manuals, worksheets, job sheets, check lists, assignment sheets, etc., which are prepared for more narrowly-specialized streams should be prepared at the institutions. This will ensure their adaptability to various local conditions since those materials are of limited transferability, depending on the available facilities, level of sophistication, qualification of teaching and supporting staff, etc., so as to meet the educational objectives and the needs of the learners.

(c) Specific methodology recommended for development of printed materials (mainly textbooks for mass production).

i) The syllabus of each subject should be prepared in accordance with the curriculum.
ii) The textbooks should be developed by professional teams and edited by specialists.
iii) Each draft textbook should be evaluated and revised by a special committee for textbook preparation.
iv) Experimental textbooks should be tested at nominated schools.
v) The experimental textbooks should be revised, modified, if necessary, and finally published for distribution.

(2) Production of various other non-projected aids

(a) Costly non-projected aids like working models and simulators should be prepared centrally.

(b) Simple and less sophisticated models, which do not require special construction techniques should be produced at institutional level, utilizing locally-

available, low-cost indigenous materials and could be produced with students' participation during workshop practice. These include simple models, either produced locally or discarded machine parts and components. To reveal the internal features of some machine elements, or to illustrate their principle of action, it is often necessary to cut away parts of them, and the various surfaces of the sectioned models could be painted in different colours to add clarity and neat appearance.

(c) Huge machines, distant objects, or complicated tiny mechanisms should be demonstrated through simplified scaled-down models, or enlarged models, which could also be designed and constructed with active student participation during their workshop practice, both in mechanical and in civil/building trades.

Where the local conditions permit, some institutions may specialize in the mass production of certain prototype teaching aids for distribution to other schools and institutions.

(d) Low-cost materials like charts, posters, drawing diagrams, flip charts, etc. should be also prepared at institutional level. The materials required for their preparation should be supplied by the institution or by the government.

(e) Specific methodology recommended for development of non-projected aids.

i) Charts, posters and drawings, the need for which is identified through macro and micro planning, should be produced by using simple instruments like epidioscope for projection and simple graphical techniques could be used to give three-dimensional effect of the depth.

ii) Models

Teaching models should be developed on the basis of the needs of the curriculum and the specific educational objectives. Their design should combine simplicity and basic requirements dictated by the specific subject matter. Their production should be easy, within the capability of the instructors and students building them from low-cost materials, and prepared with the available machines. It is recommended that the first prototypes of each model be first evaluated in classroom experimental use, then modified, if necessary, and finally produced in the required quantity.

(3) Projected teaching aids (software for projection)

(a) A central educational-film lending library must be established for procuring and distributing educational films, video-tapes etc.

(b) An audio-visual centre (AVC) should be developed at each institution for procurement, preservation and distribution of various audio-visual materials like transparencies for overhead projectors, film-strips, film slides, audio tapes (for recording sound) and, where the facilities permit, even video-tapes.

(c) Local production of overhead projector transparencies, slides and filmstrips could be organized, according to the needs of each subject, at institutional level.

Especially in the technical subjects of mechanical and civil/building trades the overlay transparencies (for OHP) proved to be most effective. Their production and mounting is relatively simple, and once produced, recently-developed inexpensive methods for reproduction (e.g. thermo-copying) allow their mass production by specialized AVC for distribution to other institutions. Properly designed, these overlay transparencies could explain step by step various mechanical (or building) constructions, the working principles of mechanisms, the assembly of machine components, etc.

(d) In order to enable all in-service teachers and instructors to produce their own software for projection, wherever necessary, they should be trained through special short-term in-service courses, while for the teacher-trainees at the technical teacher training institutions such a course should be a compulsory part of the training programme.

3. <u>Development of instrument for selection, continuous evaluation and improvement of teaching and learning aids</u>

a) For selection of aids, it is recommended:

(1) A central committee consisting of teachers, curriculum developers and educational technologists should be formed for the proper selection of learning aids for each subject in mechanical and in civil/building trades.

(2) The selection of teaching/learning aids should be based on identified educational objectives, the concrete needs of the curriculum, identified specific teaching/learning situations, availability of materials, learners' needs and abilities, and specific requirements of the topic which the instructor or teacher should cover.

b) For continuous evaluation and improvement of teaching/learning aids, it is suggested:

(1) Critical review from senior students, teachers and instructors of the utility of the aid in classroom use should be considered for its continuous evaluation and improvement.

(2) New processes and techniques, modern mechanical technologies, or in civil/building contemporary industrial practices should be observed and the information collected should be used to modify, improve, and, further develop the teaching/learning aids, so as to expose the students to an environment which is close to their future real-life situations.

4. Recommended communication system for exchange of information:

a) Member countries should try to exchange their prospectus, newsletters, journals, annual reports and educational development programme among themselves through ACEID.

b) Exchange of personnel of civil/building trades among the member countries.

5. Based on a more detailed study of some particular aspects related to the specific character of the various mechanical and civil/building technical subjects, the working groups of the meeting made the following proposals in these two respective areas:

a) Specific suggestions for the development of instructional materials for mechanical subjects

(1) Printed instructional materials for mechanical subjects such as textbooks, workbooks, laboratory manuals, job sheets, work sheets, etc., corresponding to the prevailing technology, must be produced indigenously to cater to the needs of the students at all levels.

i) For all vocational trades, governmental agencies should be responsible for promotion of the production and the distribution of textbooks and other printed materials at low cost. Where this is not possible, private agencies and other institutions should undertake this work, but under the supervision of the respective ministry or central agency.

ii) For the various institutions of technical education, the central curriculum development units should identify teachers with talent and expertise and encourage them by providing adequate facilities to produce textbooks and other high-quality printed materials. For the good quality of technical drawings and illustrations, specialist draughtsmen should be employed. The production and distribution of such printed materials can be channelled through commercial publishers.

iii) It is recommended that every country should adopt as far as possible the international standard of units and measurements for instructional purposes in all mechanical subjects.

iv) While instructional materials for vocational education should provide less theoretical and more practical details concerning the mechanical subjects

contents, like various machine shop operations such as blacksmithing, fitting, turning, welding etc., the instructional materials developed for the respective subjects for technician education should also include the theory of design, with practical application through special projects. This would stimulate the learners to study more independently, to explore further and to investigate, until they become real specialists in their field.

v) Practical exercises must be designed so as to realize economy of materials consumed. For this purpose special exercises developing multiple skills could be designed, using the same material repeatedly:

- For example, one single piece of mild steel plate can be used for sawing, filing, shaping, drilling holes, welding etc.
- Recycling of materials for optimum use, like welding and shearing.
- Using the same material for a progressive set of operations such as turning, taper turning, grooving and threading etc.

vi) Skill development stimulated by industrial practice should be introduced in a manner that will help the students to acquire the degree of accuracy required.

vii) Use of check/inspection sheets by the students should be promoted to acquaint them with quality control methods.

viii) Some more complex projects involving a sequence of operations, fabrication and assembly, where the final product could be useful for promoting self-reliance of the institution, or for the needs of the industry or the community should be introduced in the technical teaching practice. For example, these projects may be designed to produce a machine vice, some sheetmetal trays, containers, tool boxes, various hand tools etc.

(2) Non-projected visuals.

i) Various illustrative materials, like drawings, posters and charts must be liberally used for illustration of the working principles of the various mechanisms and machines, and their details or their construction, often revealed through 'exploded views', assembly drawings, etc. These illustrative materials may also include safety posters, or teaching charts illustrating various principles of machining, e.g. grinding, milling, or showing different types of welding techniques providing information on various cutting speeds and feeds for different materials subject to lathe operation, the principle of work of the internal combustion engine, etc.

ii) Three-dimensional models used to illustrate various constructions for example: scaled-down or enlarged models should be produced from inexpensive materials such as wood, plastics, metals,etc., along with discarded actual machine parts such as automobile parts and components.

(3) Software for projection

i) Software in the form of slides or film-strips should be developed in the form of packages for all mechanical subjects and supplied to every institution. The planning, production and distribution of these materials could be organized on a national level through central governmental effort, wherever feasible.

ii) Overhead projector transparencies should be prepared by the teachers themselves for selected topics, depending on the needs of instruction of each topic within certain subjects.

iii) Educational films could be used on a limited scale wherever possible. However, some countries like Japan, for example, have found it more effective and economical to reproduce films on video tape for telecasting, provided that their classrooms are equipped with T.V. receivers.

iv) Sophisticated audio-visual materials in the form of CCTV, computer-assisted instruction, computer-managed instruction, etc. can also be adopted whenever feasible.

b) <u>Specific suggestions for development of instructional materials in civil/building subjects</u>

(1) The contents of the instructional materials for civil/building subjects should be oriented to cater to the needs of the immediate development programme of the country, according to its national policy and using the national resources and manpower of the country.

(2) The instructional materials for civil/building subjects should incorporate national standards, international system of units and international standards, international practices; whenever necessary.

(3) The instructional materials for civil/building subjects should be designed so as to cultivate basic skills and knowledge of related trades through introducing real practical situations, incorporating contemporary construction methods, materials testing, management, survey and new building techniques.

(4) The students of civil/building trades should be trained to develop their drawings of the building construction details using the appropriate construction standards. Therefore all instructional materials should correspond to these requirements.

(5) The instructional materials for civil/building trades should be designed so as to assist the development of the skills and abilities required for getting employment or self-employment of the students/trainees.

(6) Various building constructions could be understood easily if three-dimensional models accompanied by perspective drawings, or isometric drawings, and their respective orthographic projections are demonstrated simultaneously during a lesson/lecture/practical demonstration. In order to expose the students continuously to such environment, all respective classrooms, laboratories and workhops should have a permanent display of those materials.

(7) In order to develop simultaneously their practical skills and observational abilities, the students could be involved in the preparation of such teaching/learning aids through team work. In this way they could draw and build mock-ups or scaled-down models of various bridges, houses, roof constructions, furniture, etc.

(8) Through organizing of exhibitions of students' made models and other teaching aids, and rewarding the most productive, skilled and inventive students for their work, they can be strongly motivated and some of them would start developing the creativity of future designers at this stage.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE REGIONAL CO-OPERATIVE ACTIONS

Conclusions

Through mutual exchange of their countries' experiences, and making observations of ongoing innovative projects in the host country, the participants of the T.W.G. Meeting were able to identify common trends, issues and growth points related to the development and implementation of technical and vocational education curricula and syllabi. They also analysed and synthesized experiences in production and proper utilization of relevant instructional materials.

Through identifying various problems and constraints and various strategies and methodologies applied to solve these problems, and through identifying some innovative features in this area, the participants have been able to conclude that in most Asian countries there is a growing realization of the need to train capable technical manpower. Trained manpower was seen as a pre-requisite for the countries' development through modern industrial and technological advancement. The participating countries have thus organized their educational systems so as to meet the needs of their industrial development. This has been done by providing adequate education and training of skilled technical personnel particularly in the field of mechanical and civil/building trades at all levels through a variety of formal and non-formal educational systems. It was realized that for the successful fulfilment of the needs for well-trained technical manpower special emphasis should be laid on closer links between science educators and technical/vocational educators, providing for the improvement of the basic scientific theoretical background of the learners as a stepping stone for the acquiring of further theoretical knowledge in the various special technical subjects, with the final aim to relate this knowledge to the development of productive employable technical skills.

The outstanding advances of some countries in their policy, strategy and implementation of curriculum planning and instructional materials design have a vast potential of shareable experiences to offer for the benefit of some other countries.

There is an increasing awareness of the need for inter-country co-operation in the area of vocational and technical education in general, and in curriculum development as well as in the design, production, evaluation and utilization of instructional materials for the mechanical and civil/building trades in particular. This need emanates from the dynamic nature of the technological development and innovations which require a continuous flow of information and co-operation among the APEID Member States. Therefore, as a follow-up of the Technical Working Group Meeting, the participants made the following suggestions regarding inter-country co-operation.

General recommendations for collaboration among participating countries

It was suggested by the participants that the activities in the area of curriculum planning and instructional materials development for the mechanical and civil/building subjects are not to be limited to the centres and institutions represented at this workshop; other agencies in each participating country should be involved in the curriculum development and instructional materials design. There is thus a need for collaboration on a broad basis among the participating countries. The following measures were recommended in this connection:

1. The participants of the workshop should take suitable measures to bring the work of other countries that they studied during the Technical Working Group Meeting to the notice of the relevant agencies within their own countries.

2. It is recommended that the participating countries hold some follow-up programme based on the suggestions that have been adopted during the meeting in respect of curriculum planning and development of instructional materials.

3. The institutions and agencies represented at the meeting should keep each other informed of their future work in order to maintain a continuous flow of information about their work and future plans. Also, they might seek advice of sister institutions and agencies in the other countries whenever necessary.

4. At the implementation stage of various projects related to assessment and revising of curricula, the countries could involve sister agencies of other countries. These agencies should offer help particularly when the subject matter to be included in the various technical courses, e.g. in civil/building trades, pertains to common geographical, historical and socio-economic conditions of other countries, or in the case of mechanical trades this should be based on commonly-used technologies. In other areas, they may exchange materials to serve as examples for future development of such materials in the receiving countries.

5. The Associated Centres in the Member States should organize in-country training workshops involving the in-service teachers of the respective subjects, so as to provide the necessary training that would enable them to produce their own instructional materials relevant to the needs in the specific subject areas, utilizing available resources from their immediate environment. Participation of respective specialists in mechanical or civil/building subjects from other member countries in such workshops would be also desirable.

6. Systematic, comprehensive evaluation of the materials produced at these workshops and of those to be generated through subsequent programmes at APEID Associated Centres should be undertaken in the participating Member States.

7. Whenever appropriate, the Member States should include development and implementation of instructional materials for science education which is supportive of technical education programmes in general, and of mechanical or civil/building subjects in particular.

8. ACEID must try to explore the possibilities of associating with, and utilizing the resources of, other regional and sub-regional organizations and institutions within the UN system such as ILO, FAO, UNICEF, UNIDO and others, for the purpose of supporting activities in the Member States associated with promotion of new approaches to curriculum development and instructional materials production for the respective areas of mechanical and civil/building trades.

9. ACEID should assist in regional, sub-regional and in-country training programmes for the design and production of appropriate instructional materials, and in their proper use and evaluation. These training programmes should include attachment of fellows to various centres in the Member States where considerable progress in this direction has been achieved, so that realistic on-the-job training may be obtained and experiences shared. The current activities of Unesco/Japanese Funds-in-Trust Mobile Training Team on Educational Technology may also be mobilized for this purpose, at the request of the Member States.

10. ACEID should promote comparative analytical studies of successful experiences in planning of new curricula in the Member States, and disseminate this information widely among the Associated Centres and other interested organizations in the Member States.

11. ACEID should act as a continuing clearing house for curricular and instructional materials produced in the Member States and other materials relevant to the respective subject areas of vocational and technical education.

12. ACEID should promote interlinking the areas of science and technology education and vocational and technical education through collaborative actions in the process of curriculum planning and instructional materials design.

13. ACEID should select problems and issues that are of common critical concern to the Member States (as stated by them) and organize study groups to undertake in-depth study of the problems and issues in curriculum innovation required by the Member States.

Areas of inter-country co-operation in vocational and technical education

Areas in which the Associated Centres of the APEID-participating countries have offered to share their experiences with other countries with regard to curriculum planning and instructional materials development for mechanical and civil/building trades of vocational and technical education:

Areas of co-operation via exchange of information on: / Name of countries	Bangladesh	India	Indonesia	Japan	Republic of Korea	Malaysia	Pakistan	Philippines	Sri Lanka
1. Curriculum planning									
a) needs assessments (individual, social, economic)	X	X			X				X
b) curriculum research	X	X			X		X	X	
c) statements of aims, goals, objectives	X	X	X	X	X	X			X
d) curriculum organization and structure	X	X	X	X	X	X	X	X	X
e) task analyses	X	X			X			X	X
f) evaluation schemes	X	X	X		X				X
g) list of curriculum planning/research agencies	X	X		X	X				X
2. Instructional materials development									
a) texts/laboratory manuals work sheets.	X	X	X		X		X		
b) charts, posters, graphs	X	X						X	X
c) syllabi/lesson plans	X	X	X		X	X			X
d) test and evaluation materials	X	X			X		X		X
e) models, simulators, training kits		X		X				X	X
f) films				X	X				
g) transparencies								X	
h) video tapes					X				
i) tape/slide series				X				X	
j) tape/filmstrip series									
3. Staff development on exchange basis	X						X	X	X
a) facilities offered	X	X		X	X			X	X
b) expressed needs		X	X		X			X	X

ANNEX I

List of participants and observers and secretariat of the meeting

PARTICIPANTS

BANGLADESH	Mr. M.A. Latif Vice Principal Dacca Polytechnic Institute Dacca
INDIA	Dr. V. Thanikachalam Assistant Professor of Civil Engineering Technical Teachers' Training Institute Adyar, Madras
	Prof. N. Selvarajan Professor and Head Department of Mechanical Engineering Technical Teachers' Training Institute Adyar, Madras
INDONESIA	Mr. K.S. Siregar Technical Education 1st and 4th World Bank Education Projects Ministry of Education and Culture Directorate for Technical and Vocational Education, Jakarta
JAPAN	Mr. Akira Konno Professor Toyohashi Technical and Science University Aichi, Japan
	Mr. Hiroshi Itoh Assistant Professor Nagaoka Technical and Science University Nagoaka-shi, Niigata, Japan
MALAYSIA	Mr. Omar bin Man Organizer of Technical and Vocational Education Technical and Vocational Education Division Ministry of Education Kuala Lumpur
	Mr. Abdul Aziz bin Hasbullah Organizer of Technical and Vocational Education Technical and Vocational Education Division Ministry of Education Kuala Lumpur

PAKISTAN	Mr. Mehtab Hussain G. Aghani Chief Instructor Swedish-Pakistani Institute of Technology Landhi, Karachi
PHILIPPINES	Prof. Diosdado C. Nicdao, Jr. Head Architecture and Fine Arts Technological University of the Philippines Metro Manila
	Mr. Roberto N. Huang Head, Product Research and Production Development and Chairman, Engineering Programme Technological University of the Philippines Metro Manila
REPUBLIC OF KOREA	Dr. Yung Dug Lee President Korean Educational Development Institute Seoul
	Dr. Kim Mun-han College of Engineering Seoul National University Seoul
	Prof. Lee Jae-won College of Industrial Education Chungnam National University Chungnam Province
	Dr. Lee Kwan President Ulsan Institute of Technology Ulsan, Kyeongnam Province
SRI LANKA	Mr. S. Kapuduwa University of Moratuwa Colombo

OBSERVERS

Dr. Donald G. Lux
Professor and Chairman
Faculty of Industrial Technology
The Ohio State University
Columbus Ohio
U.S.A.

Mr. Ha-Shik Choi
Educational Specialist
Ministry of Education, Seoul
Republic of Korea

Mr. Sang-Duk Ahn
Educational Specialist
Ministry of Education, Seoul
Republic of Korea

Mr. Jong-Sung Lee
Korean Educational Development Institute
Seoul, Republic of Korea

Mr. Tae-Wey Chung
Educational Specialist
Ministry of Education, Seoul
Republic of Korea

Mr. Byung-Ho Youn
Educational Specialist
Ministry of Education, Seoul
Republic of Korea

SECRETARIAT

Host Institution

Dr. Se-Ho Shin
Korean Educational Development Institute
Seoul, Republic of Korea

Dr. Jeoung-Keun Lee
Senior Researcher
Korean Educational Development Institute
Seoul, Republic of Korea

Asian Centre of Educational Innovation for Development, Unesco Regional Office for Education in Asia and Oceania, Bangkok

Mr. A. Dyankov
Specialist in Instructional Materials, ACEID
Unesco Regional Office for Education in Asia
and Oceania, Bangkok
Thailand

Dr. M.C. Pant
Specialist in Science Education, ACEID
Unesco Regional Office for Education in Asia
and Oceania, Bangkok
Thailand

ANNEX II

Officers of the Meeting

Chairman	:	Dr. Yung Dug Lee (Republic of Korea)
Vice-Chairmen	:	Prof. N. Selvarajan (India)
		Prof. Akira Konno (Japan)
Rapporteurs	:	Prof. Diosdado Nicdao (Philippines)
		Mr. Abdul Aziz bin Hasbullah (Malaysia)
		Mr. S. Kapuduwa (Sri Lanka)
Secretaries	:	Dr. Jeoung-Keun Lee (Republic of Korea)
		Mr. A. Dyankov (Unesco/ACEID)

ANNEX III

Working Groups for Analysing and Synthesizing the Asian Experiences

	Countries	Members	Rapporteurs
Group I	Bangladesh	Mr. M.A. Latif	Mr. Abdul Aziz bin Husbullah
	India	Dr. V. Thanikachalam	
	Republic of Korea	Dr. Kwan Lee	
Group II	Japan	Mr. Hiroshi Itoh	Mr. S. Kapuduwa
	Pakistan	Mr. Mehtab Hussain Aghani	
	Sri Lanka	Mr. R. Huang	
Group III	Indonesia	Mr. K.S. Siregar	Prof. Diosdado C. Nicdao, Jr.
	Malaysia	Mr. Omar bin Man	
	Philippines	Dr. Jeoung-Keun Lee	
Group IV	Republic of Korea -	Dr. Mun Han Kim	Prof. Diosdado C. Nicdao, Jr.
	visits	Dr. Jae-won Lee	Mr. Abdul Aziz bin Husbullah

ANNEX IV

A. Inaugural Address

by Yung Dug Lee
President of KEDI

My esteemed fellow colleagues from Unesco, distinguished delegates to this Meeting, ladies and gentlemen!

I have pleasure in inaugurating this Technical Working Group Meeting on Curriculum Planning and Instructional Materials Design for Vocational and Technical Education, organized by Unesco Regional Office, Bangkok and hosted by the Korean Educational Development Institute.

May I say at the outset how happy I am over the choice of Seoul and our Institute as a hosting organization. I extend my cordial welcome to the distinguished delegates to the Meeting from the member countries in the Region.

As you may know, the Republic of Korea is actively engaged in a process of national development. What we have accomplished over the past two decades surpassed our expectations indeed and, needless to say, education, of all, has been the most dynamic agent for this rapid progress.

Since the Liberation in 1945, the educational development in the Republic of Korea, particularly in terms of quantitative aspect has been phenomenal. Now, we are endeavouring to expedite its qualitative development, with a view to achieving a balanced improvement of the educational system as a whole. At this point, it would be worthwhile to remind ourselves of the truism that, if an educational system is to be viable in the contemporary world, it must have the ability to keep itself fully relevant to our present needs.

Living in the process of rapid social transformation, we are confronted with many pressing needs, many of which can be met through educational process. As Republic of Korea is unfavourably endowed with natural resources, the dominant need has been for the development of human capital resources. This need is further heightened by the national policy which throws its full weight behind the industrial development of the nation as an instrument for development.

Given this mandate, we have to tap fully the hidden capabilities of our population. Education, with its primary concern for a maximum self-actualization of an individual, needs to pay due attention to the development of productive and useful skills. Such a functional reorientation will not only make the system of education fully relevant to the contemporary needs but will also help to release the tremendous energy of our people for maximizing production.

Granted the privilege to inaugurate this Meeting, I avail myself of this opportunity to highlight some issues relating to the educational process of technical manpower development, as they are considered relevant

to this Meeting. There are numerous issues worthwhile to take note of in this relation. Among those, three issues seem to stand out most prominently.

The first issue is related to the conflict in viewing the educational process of technical manpower development; some view it as education, whereas others view it as training. We are frequently struck by the question from the people who are visiting technical high schools where a heavy emphasis is laid on programmes for developing a particular set of productive skills, "Is this what they are doing really education?" This question seems to refer to the reality that the programme of some technical high schools is geared to prepare students for Grade II craftsmen. It is clear that these people uphold the objectives of education to provide more fundamentals aloof from what is needed in daily living.

Many scholars still gravitate towards the notion that education is a long-term process with rather broad goals, through which individuals are prepared for uncertain needs of the future, whereas training has specific needs to be met in the immediate life situation. Given these two choices, what should we stand for in organizing the programme of the technical high school?

I am to say that it is not the question of either one or the other. It would rather be desirable to have an adequate mix of the two, although in actual fact, one can not draw a demarcation line between the two. The matter of relative emphasis between them depends largely on the stage of development in industry and manpower supply situation of a given society. In the Republic of Korea, for example, a heavier weightage may well be given to education at this stage where the shortage of craftsmen has been relieved considerably. For those who have gone through the training-biased programme, it is imperative to provide opportunities for retraining on a continuing basis.

The second issue concerns the contents and methods. We are well aware that facilities and equipment are not to be dispensed with in technical education. It should be borne in mind, however, that they constitute a necessary condition but not a sufficient condition for quality education. I feel that a massive revolution is yet to come about in the educational system, making for a fundamental shift from preoccupation with the external conditions to a profound concern with "what should be taught and in what way?" It may take great efforts to search for more relevant curriculum and for effective ways of teaching. The establishment of a research centre exclusively related to technical education may be a vital investment to this end.

Thirdly, "how to secure able teachers" is a constant challenge to our endeavouring to upgrade technical education. Whatever the impact of educational technology may be, the clear fact remains that the chief agent in the educational process is the teacher. Therefore, the importance of recruiting capable teachers can never be over-emphasized. Nonetheless, the recruitment of well-qualified teachers is increasingly handicapped in proportion to the lucrativity of working with industrial firms. The economic factor such as salary scale

is not the whole point. There is more to say about its attractiveness in terms of social status. Let alone the monetary incentive, teachers have lost the prestige they had entertained formerly. Paradoxically, it is taken for granted that technicians preserve higher socio-economic status than their teachers. Viewing from the view-point of professional competency, it is quite possible for the former to excel the latter, thus deserving a commensurate treatment. Taking the matter in the other way round, a humble question can be raised, "Isn't it possible to expect just the opposite to prevail in our society?" This would be more desirable.

All problems relating to technical education today revolve around these three issues. Although they look complicated, they are not of such a nature that defies solution. For those seeking solution measures, I wish to suggest some directions of our future activities.

Firstly, the goals of technical education should be clarified. The debate over whether technical education is an education or training is due to the ambiguity of its goals.

Secondly, technical education should be viewed in a broad context and in a long-term perspective. It should be more desirable to have an orientation towards producing all-rounded persons than gearing them to specific occupations that await trained people.

Thirdly, technical education should be future-oriented by equipping youngsters with the ability to adapt to changing situations. In particular, it is important to sensitize them to technological changes.

Fourthly, to simply imitate foreign technology is not enough to make positive impact on development. Technical education should develop in youngsters such traits as inquiry and creativity, then they can take an active part and make a significant contribution to the country's social and economic development.

Fifthly, technical education should provide for the cultivation of a healthy attitude to work and an attitude of mutual co-operation. It is also important to promote an appropriate value system suited to national development.

Sixthly, teacher preparation in technical education constitutes an important realm of in-depth study. An incentive scheme must be conceived, while searching for various alternatives to teacher preparation.

Confronted with the various problems of technical education, however, I take a great comfort that this meeting brought together the experts of Asian countries in a collaborative attempt to search for their solutions. The present meeting is, I understand, providing an opportunity for APEID member countries to pool their experiences in some field of the technical education and discuss fresh measures for the future. I am confident that it will turn out professionally rewarding to all of the participants.

I inaugurate with the greatest pleasure this Technical Working Group Meeting on Curriculum Planning and Instructional Materials Design for Mechanical and Civil/Building Subjects of Vocational and Technical Education.

B. Welcome address

by Mr. Kim Kyu Taik
Secretary General of the
Korean National Commission
for Unesco

After welcoming the participants of the meeting and thanking the host institution and ACEID for the active part in the preparation of this meeting, Mr. Kim Kyu Taik addressed the meeting by saying:

"As I am sure you all know, the Republic of Korea is among that selected group of Asian nations which lead the world with very high rates of economic growth. Of course, the process of national economic development is extremely complex. But the cause of such growth is simple. Excellence in education is the single most crucial ingredient in the many successful examples of national advancement now under way in Asia. The Republic of Korea's current economic expansion is a case in point. Our present growth is based on the considerable investments awarded to education during the 1950s and 1960s.

In the same manner, future economic development depends upon the propriety of our educational approach today. Both the industrial and commercial sectors of our economy are demanding an ever-increasing supply of well-educated and skilled workers, particularly in the areas of specialized technical and vocational training. The resultant pressures on our educational system are quite serious. We must either allow to slow down the national economy or respond through increasing concentration on vocational and technical education, and through curriculum development in these fields. Being aware of this serious condition, our government has already launched a major new thrust on technical and vocational education in which the resources of commercial and industrial enterprises are utilized to obtain not only well-educated, but also well-trained, high school graduates.

Ladies and gentlemen, we of Asia are currently standing at an important crossroads of history. Behind us we leave colonialism, famine, war and poverty. Ahead of us lie development and prosperity. Unlike our forefathers, we are privileged to view the resurgence of an entire continent, comprising more than half of the population of the world.

And yet, we cannot simply wait complacently for the promise of the future to be fulfilled. We must invest, we must plan; and we must work to realize the potential of our region. But most important of all, we must co-operate in order to ensure that regional development takes place

equally throughout all of Asia. As representatives of your individual nations, in addition to your consideration of guidelines for curriculum development during these two weeks, I hope that you will give some thought to the importance of Asian solidarity and co-operation. By working together we can assure the bright future of a new Asia. Through co-operation we can assure the resumption of our rightful place at the forefront of human affairs.

In closing, allow me to make a brief remark about APEID, the Asian Programme of Educational Innovation for Development. We of the Republic of Korea welcome the expansion of APEID into the field of vocational and technical education. Having noted the major benefits which followed directly from previous APEID activities here, we of the Korean National Commission for Unesco look forward with anticipation to APEID's activities in this new area of innovation.

Finally, although your stay in the Republic of Korea will be short, I encourage those of you who have come from other countries to take this opportunity to experience the hospitality of the Korean people. I hope that your brief visit here will be memorable, not only from a professional standpoint, but also from a personal one as well.

Thank you.

ANNEX V

List of documents and reference materials

Information documents

ROEAO-79/APEID.TWG.VTE.3.1/INF.1 - General Information Paper
ROEAO-79/APEID.TWG.VTE.3.1/INF.2 - Provisional List of Participants

Working Documents

ROEAO-79/APEID.TWG.VTE.3.1/W.D.1 - Provisional Agenda
ROEAO-79/APEID.TWG.VTE.3.1/W.D.2 - Provisional Schedule of Work

ROEAO-79/APEID.TWG.VTE/2 - Bangladesh - The Concept of Technical Education in Bangladesh by M.A. Latif

- India(1) - Curriculum Planning and Instructional Materials Design for Technical and Vocational Education in India for Mechanical Engineering Subjects by N. Selvarajan

- India (2)- Innovations in Curriculum Design in Civil Subjects by V. Thanikachalam

- Indonesia - Curriculum Planning and Instructional Materials Design for Vocational and Technical Subjects with main emphasis on Mechanical Subjects by K.S. Siregar

- Japan (1) - Technical Education Curriculum in Japan (Civil/Building Course) by A. Konno

- Japan (2) - Curriculum Standard for Mechanical Engineering Education in Japan by Hiroshi Itoh

- Republic of Korea (1) - Curriculum Planning and Instructional Materials Design in Building Trades in the Republic of Korea by Moon Han Kim

- Republic of Korea (2) - Vocational Education in the Republic of Korea by Jae-won Lee

- Republic of Korea (3) - Curriculum Development in the Republic of Korea by Yung Dug Lee

- Malaysia (1) - Technical and Vocational Education Curriculum Development and Instructional Materials Design for Civil/Building Subjects by Omar bin Man

- Malaysia (2) - Mechanical Trade Subjects in Secondary Vocational Schools under Ministry of Education in Malaysia by Aziz bin Hasbullah

- Pakistan - Curriculum Planning and Instructional Materials Design with Main Emphasis on Mechanical Subjects by M.H. Aghani

- Philippines (1) - Vocational and Trade Technical Education in the Philippines Focussed on Building Curriculum by Diosdado C. Nicdao, Jr.

- Philippines (2) - Curriculum Planning and Instructional Materials Design for Vocational and Technical Education with Emphasis on Mechanical Subjects by Roberto Huang

- Sri Lanka - Training provided in Civil/ Building Subjects in Sri Lanka and the National Apprenticeship Scheme by S. Kapuduwa

Reference Documents

- Curriculum Planning and Instructional Materials Design for Industrial Education in the U.S.A. by Prof. Donald G. Lux

- Strategies and Methodologies in Curriculum Planning and Instructional Materials Design in Bangladesh by M.A. Latif

- Standard Facilities and Equipment for Building Course of Technical High Schools in Japan by Ministry of Education, Japanese Government

- Courses of Technical High School Completion Students by Type of Industries - A survey in Japan

- Thoughts on Teachers and Teacher Education Innovations by Yung Dug Lee

Info TVE 5 - Technical Teacher Education Course - Unesco, Paris

Info TVE 7 - Printed Technical Learning Materials - H. Unterbrunner, Unesco, Paris

- Instructional Resource Centre-Roles and Functions by Prof. N. Selvarajan, India

- Team Teaching An Innovation in Education by Prof. N. Selvarajan, India

- Criteria for Selection of Instructional Materials by Dr. V. Thanikachalam, India

- Vocational and Technical Education in India - T.T.T.I., Madras

- Vocational - Technical Education in the Republic of Korea - KEDI, Seoul

- Prospectus 1979-80 Technical Teachers' Training Institute - Southern Region, Adyar, Madras - T.T.T.I., Madras

- List of Productions 1966-1978, T.T.T.I., Madras

- List of Materials Under Production from 1979, T.T.T.I., Madras

- Outline of the Technological University of Nagaoka, 1979, T.U.N., Japan

ANNEX VI

Sample Forms for Instructional Planning

A. Course Plan

Course No.: Class:

Instructor: Year:

Lecture No.	Date	Time	Topic Test	Details

Textbooks:

Reference Books:

Journals:

Supporting materials:

B. Macro Planning
(Detailed planning of objectives, media and methods)

Syllabus Extract: Class:

Entry behaviour: No. of students:

General objective:

Specific objectives	Teaching points	Students' abilities to be developed	Teaching methods	Teaching/ learning aids	Book reference	Evaluation	Cumulative time

97

C. Micro Planning

Entry behaviour:

Syllabus content:

General objective:

Specific objective(s):

Class:

Expected outcome:

Teacher's activity	Student's activity	Resource materials	Time

D. Laboratory Schedule

No.	Experiment details	Evaluation

Laboratory Manual No.

ANNEX VII

List of Institutions visited in the host country:

1. Seong Dong Mechanical High School, Seoul
2. Incheon Vocational Training Institute, Seoul
3. KEDI Media Centre, Seoul
4. Busan Mechanical High School, Pusan
5. Hyun Dai Heavy Industries and Shipbuilding Industrial Co.
6. Pohang Iron and Steel Co. Ltd. Pohang
7. Pohang Iron and Steel Technical High School, Pohang.

ANNEX VIII

The participants developed and utilized the following format for compiling information during the visits.

Institution: _____

Place: _____

1. Background
2. Entry requirements, duration of training, outcome
3. Objectives (aims)
4. Training offered
    a) Theory, practice, laboratory work, etc., ratio between theory and practice
    b) No. of classes/groups, ratio between teachers/instructors and trainees
5. Facilities available and their utilization
6. Inputs
7. Types of instructional materials, their design, production, evaluation, distribution and utilization
8. Problems, constraints and methodologies for solving them
9. Key innovative features.

ANNEX IX

Visits to some innovative projects

In the process of synthesizing the Asian experiences in the development of curriculum and preparation of instructional materials, the participants of the Technical Working Group Meeting conducted field visits in the host country to a few projects with innovative features in the area of vocational and technical education through formal and non-formal types of training.

The visits enabled the participants to get acquainted with some of the innovative practices now underway in the Republic of Korea. The visits revealed various methods of training, utilization of available resources and implementation of curricula through a variety of locally developed instructional materials. At the same time some problems and constraints encountered by the institutions visited were identified, along with various approaches for solving them.

Thus the experiences gained through the field visits provided the participants with some fresh ideas for their task to develop guidelines for future strategies and methodologies for curriculum planning and implementation as well as for instructional materials development and utilization.

1. Seong Dong Mechanical High School, Seoul

1. Background

This school was founded in 1922 and reorganized in 1975 as "Seong Dong Mechanical High School". This is one of the 18 Technical Mechanical High Schools in the country.

2. Entry requirements: Graduates from junior high school are selected through entrance examinations which include aptitude tests. The school offers training courses in precision mechanics, instrumentation, plumbing and welding, electrical wiring and rewinding electric motors and basic metallurgy. Forty-nine per cent of the time is allocated for practical training, 21 per cent for selected theory and the remaining 30 per cent of the time is devoted to general subjects (arts, language and culture). On the average, 20 students are under the care of one staff member. The school is equipped with 245 lathes, milling machines, grinding machines, shaping machines, drilling machines, and 6300 pieces of measuring instruments. The workshops are housed in a building with adequate area of 8013 m^2. An electrical workshop, built on the area of 743 m^2 houses electrical machines like generators, motors, power transformers, T.V. laboratory, electrical wiring workshop, electrical equipment maintenance workshop, equipped with oscilloscopes and other necessary equipment. The metallurgy shop, built on area of 770 m^2, includes a metal casting workshop, wood-pattern-making workshop, heat treatment workshop, cupola, electric furnace, core drying furnace, crucible furnace, sand mixer, metallographic microscope, woodworking tools, instruments etc. All these facilities are fully utilized by the students. To impart training on the numerical controlled machines,

the school has one numerical controlled simulator. The plumbing and welding laboratory accommodates P.V.C. pipe works, arc welding, gas welding, spot welding, bending machines, power press and universal cutting machine.

The school is financed by the government. The curriculum is prepared by the National Vocational Council under the Ministry of Labour and Employment. The school prepares its own instructional sheets, flip charts, lesson plans, and practical job-assignments. The school has its own audio-visual centre to help the teachers. The students' evaluation in theory subjects is done by the teaching staff of the school. However, the students have to appear for the National Skill Test for the evaluation of their practical skills. The students are trained to achieve a high degree of precision, reaching up to 1/1000 mm. Some of the students are aiming to continue their higher education in engineering after completion of the school course. A certain per cent of the seats are reserved for the graduates of the technical high school. The school repeatedly proved its high standards of training by the competitive vocational skill test. The school maintains very close liaison with industry.

2. Incheon Vocational Training Institute, Incheon

1. Background

The school was established in April of 1975 under the Ministry of Labour Affairs (public control). The first class began training in March of 1976. The following year the school was transformed into a Vocational Training Foundation (private control).

2. Entry requirements, duration of training, and outcome

Entrance qualifications: minimum of 9th grade schooling, age 17, good health, and written and oral tests.

Training is of twelve months' duration.

Placement rate for the three classes averages 91 per cent. Of the others, some are self-employed, attending further training, or military duty, etc.

Graduates work as craftsmen.

3. Objectives

The school philosophy was stated as "Train the man first, and then train his skills."

The general objectives were given as:

a) To breed the trainee as a sincere human being.

b) To enhance the attitude, knowledge and skill according to the needs of the industry.

4. Training offered

Training in eight crafts: carpentry, foundry, machining, fitting, welding, electrical, electronics, and offset printing.

Capacity: 1260 per year.

Theory/practice ratio = 1 to 2.3

5. Facilities available and their utilization

Laboratories for each craft were comfortably large and well-equipped.

Each student possesses a set of basic craft tools which are in excellent condition.

Work stations are provided for each student, and each station is fully equipped.

Equipment is modern and in working order.

Classrooms were crowded but well outfitted.

The facilities were used to full capacity.

6. Inputs

The school is managed under a private governing board, but all the funding is from government sources.

7. Types of instructional materials, their design, production, evaluation, distribution and utilization.

Written instructional materials were mainly instructor-prepared and locally-reproduced. A team of staff members design the materials. A well-equipped copying room was provided for reproduction. Teacher-made demonstration boards and charts were in evidence. Regular working drawings were in evidence and being used by the students.

8. Problems, constraints and methodologies for solving them.

Initial staffing problems were solved by shifting from public to private status which increased flexibility with regard to selection, employment, and salaries.

Provisions for common audio-visual aids were not in evidence and their provision remains to be worked out.

9. Key innovative features

One-year training, divided into a first phase common to all crafts, a second phase covering specialized craft training, and a final phase which was specific job-related and often on-the-job.

Each trainee is assigned to a known prospective employer. Placement is school-provided and includes a three-year follow-up. A night-time course of about 50 per cent of the daily time but of the same one-year duration is offered for employed workers in the area of the school.

One hundred per cent resident school, both for students and staff.

Free tuition and free room and work clothes.

Students pay boarding costs.

3. Visit to the media centre of the Korean Educational Development Institute (KEDI), Seoul.

KEDI was formed in 1972 and it was primarily commissioned to the development of elementary and secondary school textbooks. KEDI has been designated as the curriculum development arm of the Ministry of Education since January 1979.

The major activities undertaken by KEDI include research and development relating to educational foundations, curriculum and educational policies, production of TV and radio programmes and dissemination of innovative programmes.

The members of the TWG Meeting have visited the educational broadcasting department which plays the role of a media centre. It was recognized that KEDI is exploiting the advantages of the broadcasting media in the education process for the purpose of raising the effectiveness of teaching and learning. The scope of the application of this media has been extended to pre-school education, school education, vocational training, non-formal education.

The major activities of this department are:

(1) Studies on the potential utility of the broadcasting media;

(2) Production of educational TV and radio programmes;

(3) Studies for improvement of the programme quality;

(4) Technical support to developers of radio and TV broadcasting programmes.

This centre has already produced 13469 radio programmes and 1696 TV programmes. The development process of T.V. programmes is organized in the following sequence:

(a) Planning
(b) Production
(c) Transmission
(d) Utilization by schools and individual home learners, and
(e) Comprehensive evaluation, which serves as a basis for the improvement of their future planning and production.

In more details, the production of this type of instructional media at KEDI goes through the following stages:

(a) Planning stage

(1) Opinion survey
(2) Annual planning
(3) Operations of deliberation committee
(4) Determination of production targets
(5) Publication of broadcast programme guides

(b) Production stage

(1) Holding subject matter committee meeting;
(2) Specification of production guidance;
(3) Production team:
i) Review of production target and determination of programme types;
ii) Collection of materials;
iii) Scenario preparation;
iv) Preparation of photographs, fine art and music materials;
v) Review meeting;
vi) Rehearsal final revision;
vii) Editing and video recording.

(c) Comprehensive evaluation

(1) Operation monitor;
(2) Opinion survey;
(3) Assessment of effectiveness.

The process of development of educational broadcasting materials adopted by KEDI could be tried in other member countries using the existing TV and radio broadcasting systems.

4. Busan National Mechanical Technical High School, Busan

1. Background: Established in 1967 under the Ministry of Education. Its name was changed from Busan Mechanical Technical School to Busan Mechanical Technical High School in 1974. It has a total number of students of 2700 with an annual intake capacity of 900 students. It has sisterhood relation with Sam-seong Heavy Industrial Company and Dae-han Shipping Company.

2. Objectives: The main objective of the school is to produce skilled technicians for the industries by giving them education and training to acquire practical skills relevant to the job requirements.

3. Training offered: It offers technician courses in the mechanical disciplines, plumbing, electrical disciplines and metallurgy.

4. Entry requirement: Students from middle school (after nine years of schooling) are qualified to apply to enter the schools. The selection of candidates is made, firstly, on the basis of their school reports, selecting the highest 6 per cent in graduation standing and, secondly, through an examination which consists of a written test (40 per cent), skill test (40 per cent) and physical test (20 per cent).

The duration of training is three years, comprising 8½ academic hours per day, 5½ days weekly.

5. Curriculum: The curriculum is prepared by the Ministry of Education, but institutions are allowed to make changes according to the local needs. Students have to pass a 'National Skill Test' held under the Ministry of Education centrally at the end of the second year. The theoretical examinations are set by the school itself. The curriculum is divided in two parts - general subjects 30 per cent and major technical subjects 70 per cent. The major technical subjects include 18 per cent theory and 52 per cent practice. The workshop practice for each student is 1,500 hours per year. The general subjects include compulsory subjects like - Korean language, ethics, Korean history, mathematics I, physical education, military drill, and selective subjects like occidental history, mathematics II, physics, chemistry, music and English language.

6. Facilities available and their utilization: The school has 10 workshops equipped with 307 lathes, 25 milling machines, 11 grinding machines, 810 workbench vices, 135 universal drafting machines and two well-equipped precision measuring laboratories. These facilities are used eight hours per day and the students are allowed to continue practical work beyond the normal class hours. Eighty per cent of the students live in dormitories, which are provided free of charge (the food is paid by the students). Well-equipped libraries and study space are adequately available.

7. Types of instructional materials: Instructional materials like textbooks and reference books are produced and supplied by the Ministry of Education. Materials like job sheets, laboratory sheets, students' assessment sheets and teaching charts and models are made by the teachers within the school, using their own discretion and creativity.

The teacher/student ratio is 1:60 in theory classes, and 1:20 in workshop practice. The workshop is utilized usually by 180 students at a time, comprising three groups of 60, each performing different assignments under the guidance of nine instructors.

In total there are 100 teachers for the 2700 students, giving an average teacher/student ratio of 1:27.

A teacher has normally 20 to 25 academic hours weekly teaching load.

8. Input: All financial investments are made by the Government. Industries provide some investment in the form of financial allowance to the teachers and donation of some machinery and equipment.

9. Outcome: The school graduates may be classified into two categories: 'general technicians' and 'precision technicians'.

10. Problems and constraints:

(1) The students having brilliant academic records at the middle-school level suffer from the feeling of being surpassed in position during their later professional life by students with lower academic achievements but having obtained higher education.

(2) The terminal nature of their education demoralizes the students in their professional career.

(3) A sort of 'lock-step' basic training continues for six months before moving to more challenging activities. This type of instruction is more frustrating than motivating for the able students.

(4) A too-high teacher-student ratio (1:60) in theory classes particularly, is jeopardizing the individual attention towards each student's needs.

11. Key innovation features:

(1) Providing compulsory six months industrial training after completion of the first six months during the third year of schooling.

(2) Organizing and mass participation in the 'National skills development competition' creates a positive attitude towards precision work in the workshop practice.

(3) Bank loans, instead of free scholarships, to support the students' expenses are to be introduced now with the provision for repayment, - interest free - during the first few years of employment. This will create a sense of responsibility by creating the awareness that the student receives his education partially on his own expenses.

(4) A special allowance (bonus) for the technical teachers plus free housing facilities help to recruit and maintain top quality faculty members.

(5) Sisterhood relations with the industry provides certain employment opportunities.

5. Hyundai Shipyard Institution, Ulsan

1. Background: In just seven years Hyundai Shipbuilding has established an international reputation for quality and economy in building ships. Shipbuilding began even as the docks were under construction, and their first ship was launched in 1973. Their shipyard is the largest in the world, with a capacity to build a million-ton ship. Its labour force numbers over 30,000.

Hyundai also is internationally active in the production of steel construction fabrications. They have produced large marine petroleum platforms among their various works.

2. Entry requirements, duration of training, outcome: Hyundai has its own training centre. It provides three comprehensive training programmes of varying duration, ranging from new worker orientation to advanced training for engineers and other professionals. Over 1,000 skilled workers are trained per year. Middle and high school graduates are admitted to training. Trainees must pass the National Skill Test to obtain a license at the end of their training. Otherwise, they are not employed. However, all trainees are paid during their training.

The exact structure and content of the in-plant training is related to special theory information on a particular trade. On-the-job

training is integrated with classroom instruction.

Hyundai also operates a technical high school. Its programme is consistent with the national standards on metallurgical and machine-building processes.

3. Facilities: The shipyard facilities include a separate modern training centre with full-time staff. The facilities were only observed from outside of the laboratories and workshops, through well-designed windowed special passages for visitors who could observe the training process without their physical presence distracting the trainees during their practical work or instruction.

4. Inputs: Hyundai is a semi-autonomous government-operated industry which has many characteristics of private ownership and control. It was initiated as a government venture but has been gradually turned into a private enterprise. The Ministry of Labour provides the basic guidelines for the in-plant craftsmen training programme.

5. Instructional materials: The staff of the training centre develop their own curricula and instructional materials. Selected commercially-available materials are also integrated whenever the staff desire.

6. Key innovative features:

a) The innovations observed during this visit were more closely related to shipyard practices. Ultra-modern equipment and techniques for mass-production of sub-assemblies and assembly work on ships impressed the participants.

b) The comprehensive in-plant training observed at Hyundai Shipyard also represent innovation.

6. Pohang Iron and Steel Company Limited

Pohang Iron and Steel Company Limited was incorporated in 1968 and started its operation in 1973 with an annual production capacity of 1.03 million tons of metal.

In 1976, the production went up to 2.6 million tons per year with the opening of the second phase. During the same year the company entered into a third phase. The production has now reached 5.5 million tons per year. By 1981, the annual production is expected to reach production target of 8.5 million tons with the implementation of a fourth stage. The company incorporates three blast furnances, a foundry iron plant, two steel producing plants, a continuously casting plant, two blooming and slabbing mills, hot strip rolling mills, two plate mills, billet mill, cold rolling mill and auxilliary facilities like coke plant, power generating and distribution facilities, sintering plant, chemical biproduct plant, oxygen plant, lime calcifying plant, maintenance shop and training institutes for their own manpower.

Most of the raw materials like iron ore and coal are imported from different countries. About 85 per cent of the production is internally consumed and the remaining 15 per cent is exported.

The qualified technical personnel consists of university graduates and high school graduates. The university graduates are engineers. The technical high school graduates are technicians. Apart from their preliminary qualification, the recruits have to undergo a special training programme at the training centre of the company. The duration of the training programme is four weeks for university graduates and six weeks for high school graduates. The training instructors are recruited from within the company, primarily among those who have enough experience on the job. Retraining of the technicians is done at the end of every three years of employment. This retraining programme lasts for 12 weeks. The curriculum of the training programme is designed by the company itself. The printed instructional materials are prepared by the instructors of the company. The instructional hardware materials are supplied by the company, while the software is produced by the instructors themselves. All trainees are required to pass the National Skill Test to obtain a license in order to get a job in the company.

The company is adopting a technical high school in the city and converting it into Pohang Iron and Steel Technical High School with the aim of producing skilled technical manpower for the needs of the company.

7. Pohang Iron and Steel Technical High School, Pohang City

1. Background: The school was established in 1969 as Pohang Technical High School and was designated in 1977 to become a specialized Technical High School.

In 1978, the school name was changed to Pohang Iron and Steel Technical High School and it was taken over by the School Foundation of Pohang Iron and Steel Company.

2. Objectives:

(a) To build proper attitudes in the future technicians by cultivating appropriate working habits in their character.

(b) To develop the necessary skills required by their future jobs in the iron and steel producing industries.

3. Entry requirements: Students admitted to this school must have completed the third year of the middle school (Junior High School) and must belong to the upper 10 per cent of their class. The students are selected through interviews and physical and fitness tests.

4. Training offered: The school offers three years' training courses in different fields in iron and steel industry, like iron making, steel making, rolling, mechanical maintenance, electrical instruments, welding, and electrical technology.

(a) The students have 44 hours of study a week: 30 hours for studying technical subjects and 14 hours for general subjects. For the technical subjects, the ratio between theory and practice is 30 per cent to 70 per cent.

(b) The teacher/student ratio is 1:50 in theory classes and 1:25 in workshop practice.

5. Facilities available: The school has buildings and facilities amounting to $3,600,000 in 1978 and it is planning new facilities of around $10 million worth by 1981. The school is providing for its students dormitories, gymnasium, library, audio-visual rooms, etc.

In addition to the school facilities, the students have access to the facilities of POSCO (the mother company) for in-plant training.

6. Inputs: The students receive a loan from the government amounting to W10,000 per student on a "study now, pay later plan" programme. The school is also expecting contributions of additional learning equipment and facilities from foreign supplies, from POSCO's own equipment and other donations.

7. Types of instructional materials: Instructional materials in the school are being supplied or prepared by the instructors. Some come from other different sources. Instructional materials for subjects related to steel making are obtained from POSCO. Good examples of these are the scaled-down model of a rolling mill and the cross-section of a blast furnace. Commonly-used instructional materials are flip charts, progress charts, job sheets, instruction sheets, operation sheets, technical drawings and actual machine components.

8. Problems, constraints and their solutions: The only problems at present are the limited capacity of the school and its location.

To solve these problems, POSCO is building a new complex on a 245,000 sq. m. lot to relocate the school, increasing its present capacity, and to offer primary and secondary courses and new dormitories in a properly-situated place.

9. Innovative features:

(a) Introduction of new courses to cater for the demands and requirements of the local community's industry which is the steel industry.

(b) Adoption of the method of task analysis in the development of the curriculum.

(c) The participation of around 96 professional staff members in the planning and development of the curriculum comprising specialists, professors, representatives of the Ministry of Science and Technology, junior high school teachers, technical high school teachers, representatives from the industry, etc.

(d) Allowing students to take government license examination after three semesters of schooling.

(e) Having a liaison officer in establishing the necessary linkages between the school and the industry.

(f) Providing for lodging and boarding to all students and exempting those students who enter the school with excellent records in their entry examinations from paying school fees.

(g) Offering the teachers accommodation and special bonus in order to keep them with the school.

The *Asian Programme of Educational Innovation for Development (APEID)*, initiated on the recommendation of the Third Regional Conference of Ministers of Education and Those Responsible for Economic Planning in Asia (May–June 1971, Singapore) and the authorization of the General Conference of Unesco at its seventeenth session (Paris, 1972), aims at stimulating and encouraging educational innovations linked to the problems of national development in the Asian region.

All projects and activities within the framework of APEID are designed, developed and implemented co-operatively by the participating Member States through their national centres which have been associated by them for this purpose with APEID.

The 20 countries in Asia and Oceania participating in APEID are: Afghanistan, Australia, Bangladesh, India, Indonesia, Iran, Japan, Lao People's Democratic Republic, Malaysia, Nepal, New Zealand, Pakistan, Papua New Guinea, Philippines, Republic of Korea, Republic of Maldives, Singapore, Socialist Republic of Viet Nam, Sri Lanka and Thailand.

The Asian Centre of Educational Innovation for Development (ACEID) has been established at the Unesco Regional Office for Education in Asia and Oceania in Bangkok to co-ordinate the activities under APEID and to assist the associated national institutions in carrying them out.

The aims of APEID are:

- to stimulate efforts of the Member States to improve the quality of life of the people through creating and strengthening national capabilities for the development and implementation of innovations in education, both formal and non-formal;
- to encourage the Member States to make all groups (students, teachers, parents, village and community leaders, administrative personnel and policy makers) aware of the need for relevant changes in education (both formal and non-formal) as an essential pre-requisite for the improvement of the quality of life of the people;
- to promote understanding and appreciation of the differences in educational practices and approaches of the Member States, and thereby contribute to international understanding and the creation of a new international economic order.

Unesco Regional Office for Education in Asia and Oceania

APEID PUBLICATIONS
RELATED TO VOCATIONAL AND TECHNICAL EDUCATION

Unesco, P.O. Box 1425, Bangkok G.P.O., Bangkok, Thailand

1. *Curriculum development for work-oriented education; report of a Regional Field Operational Seminar, Japan. 1975**

2. *Diyasena, W. Pre-vocational education in Sri Lanka. 1976**

3. *Singh, P. Harbans. Centralized workshops in Singapore. 1975*

4. *Inventory of educational innovations in Asia and Oceania, EIA Nos. 96-109. 1979*

5. *Development of productive skills; report of a Sub-regional Workshop, Philippines. 1979*

6. *Vocational and technical education: Development of curricula and instructional materials for mechanical and civil/building subjects; report of a Technical Working Group Meeting, Republic of Korea. 1980*

7. *Co-operation in vocational and technical education in Asia; exploratory field studies on vocational and technical educational systems and projects. Report of Inter-country and Inter-project Study Visits. 1980*

---

* Out of stock

Published by the
Unesco Regional Office for Education in Asia and Oceania
P.O. Box 1425, Bangkok G.P.O.
Bangkok, Thailand

© Unesco 1980

Printed in Thailand